October 1961

Electrical South

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Utility engineering section begins on page 71

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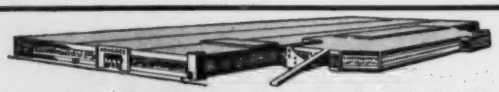

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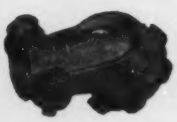

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Electrical South

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FRONT COVER—The office of E. C. Hammond, Georgia Power Company secretary, exemplifies the excellent working environment that has been achieved in the new 22-story Georgia Power headquarters building. More on this office and the building may be found in an article on page 40.

Economic comment

by J. Whitney Bunting, Ph.D.
Contributing Economics Editor

Business barometer

Those who use the stock market as a reliable barometer of economic conditions have been hard-pressed in recent weeks to prove its reliability as a harbinger of present and future business conditions.

Normally, the trend of security prices is important, when considered with other basic factors, in evaluating the confidence of business people in the health of the economy.

Moreover, it is in the stock market that the public can see evidence of the health of American corporations as highlighted by earnings of such businesses.

During the past few weeks, the market has wavered considerably after having reached all-time highs as far as the professional services are concerned in their various rating techniques. It would certainly be assumed that, as security prices rise to a level never before achieved in history, there would be continued increases in prices in most of those issues listed as "blue chip." This has not been the case in the present market.

One major unsettling circumstance has been the world political situation. As relations between the "free world" and Soviet Russia have brightened or worsened, so has investor reaction on the stock market. The possible imminence of war, either world-wide or in local actions such as Berlin, Laos, or Cuba, directs the enthusiasm of investors both for specific security issues or for investing in general.

Securities of such industrial firms as aeronautical, electronic, space and missile development, research and engineering, and basic raw materials tend to reflect war worries quite quickly. It is not unusual to see such stock prices vary by several points upon word of possible military action. This has the further impact of attracting funds away from other securities that would not be directly affected by conditions of war. It can be noted readily that this situation does create some unsettling of the normal supply and demand effect upon stock prices.

Dr. Bunting is a well-known economist and educator having special knowledge of the South.

Disturbing factor

There has been another very disturbing factor involved in the trend of current security prices. It has become quite usual for many investors to indulge in "profit-taking" when prices of particular issues have reached a figure that makes such action attractive. This action is as old as the market itself, but the new fact is that such profit-taking has been more frequent and without the wide spread of prices that formerly was the case.

Today the holders of big blocks of stocks may shift investments with only a small differential between cost and selling price in the price of a particular issue. Thus, the investor settles for a series of small profits rather than for the chance of a very large return that might be achieved if the market price of the stock continued to rise.

One can see that such a practice is not one for the small investor because the costs involved in the purchase and sale of securities would far outweigh the profits obtained. Moreover, the small investor rarely has the time or information available to him in order to make such a program effective. Consequently, the impact of the actions of those able to accomplish profit-taking is rather severe on general security prices.

When security prices become variable and show no firm movement in any specific direction, a third factor enters into consideration. This is the impact of such price vacillation upon the attitudes of the small fringe investors who have purchased securities with no firm purpose in mind and often without proper advice and management skill. These persons are apt to become frightened at even the smallest price decline if it happens to affect the security which they own.

These investors are not speculators and constitute a great number of the persons who own securities of American industry. Individually, their impact upon security prices is slight but, as a group, their actions and attitudes can be rather effective in moving prices on the market. Even though their actions are not coordinated directly, the fact that their thinking processes as directed at the stock market are almost identical causes the problem. Thus, they may be affected quite generally by any type of price decline.

These are not the only unsettling influences at work in the stock market today, but they are perhaps the most serious ones. Of the three, the factor that would be most encouraging when eliminated would be that of international tension. This would certainly stabilize the activities on the market and would remove much of the confusion now existent in stock prices.

Economic factors favorable

Reports on various economic factors continue to be basically optimistic, and there appears to be a genuine belief in the permanence of the business upswing in the final quarter of 1961 and on into 1962. It is early yet to forecast the conditions to be present in the new year, but if current indications can be believed, the strength of the business advance is great enough to make 1962 a banner year.

Two factors of great importance are the continuing decline of unemployment and the renewed upswing in industrial capital spending. Add to these two factors the heavy defense budget of the federal government and the nation's prosperity picture seems to be assured.

The decline in unemployment is a most heartening sign for it indicates that by year's end there may be less than 4,000,000 jobless in the United States. This would mean that the unemployment total would have been cut by more than a third from the high levels earlier this year. This certainly constitutes real economic progress.

Moreover, the attitudes of people

(Continued on page 140)

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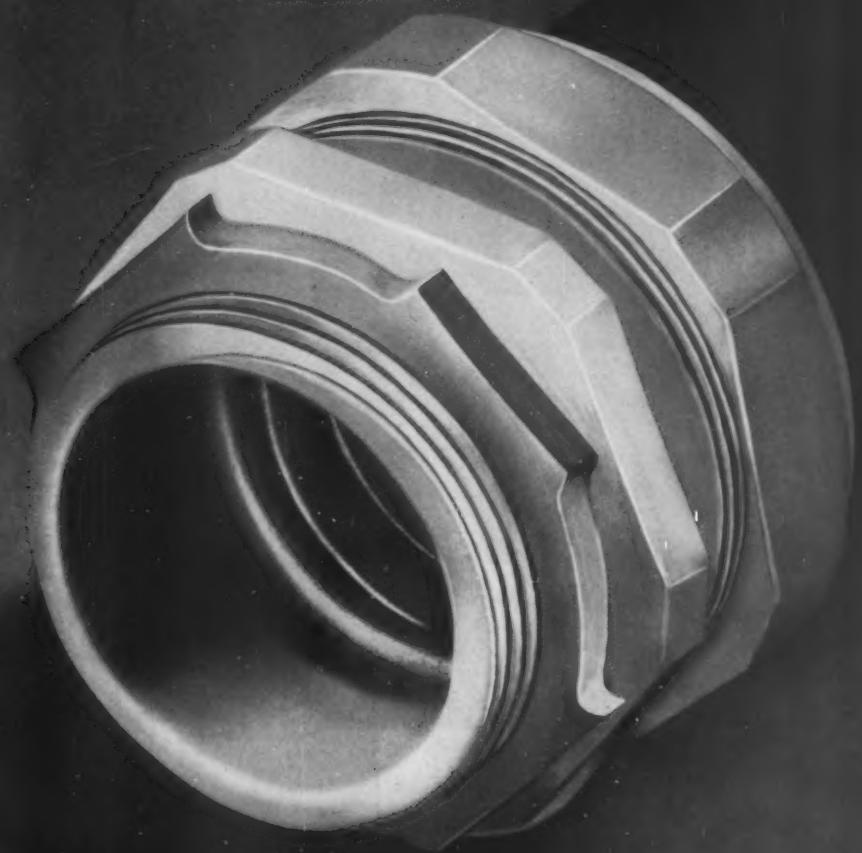

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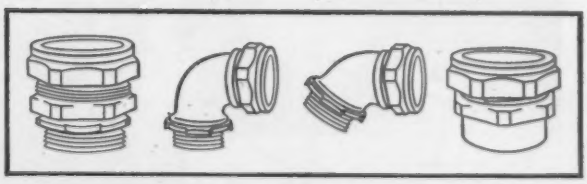

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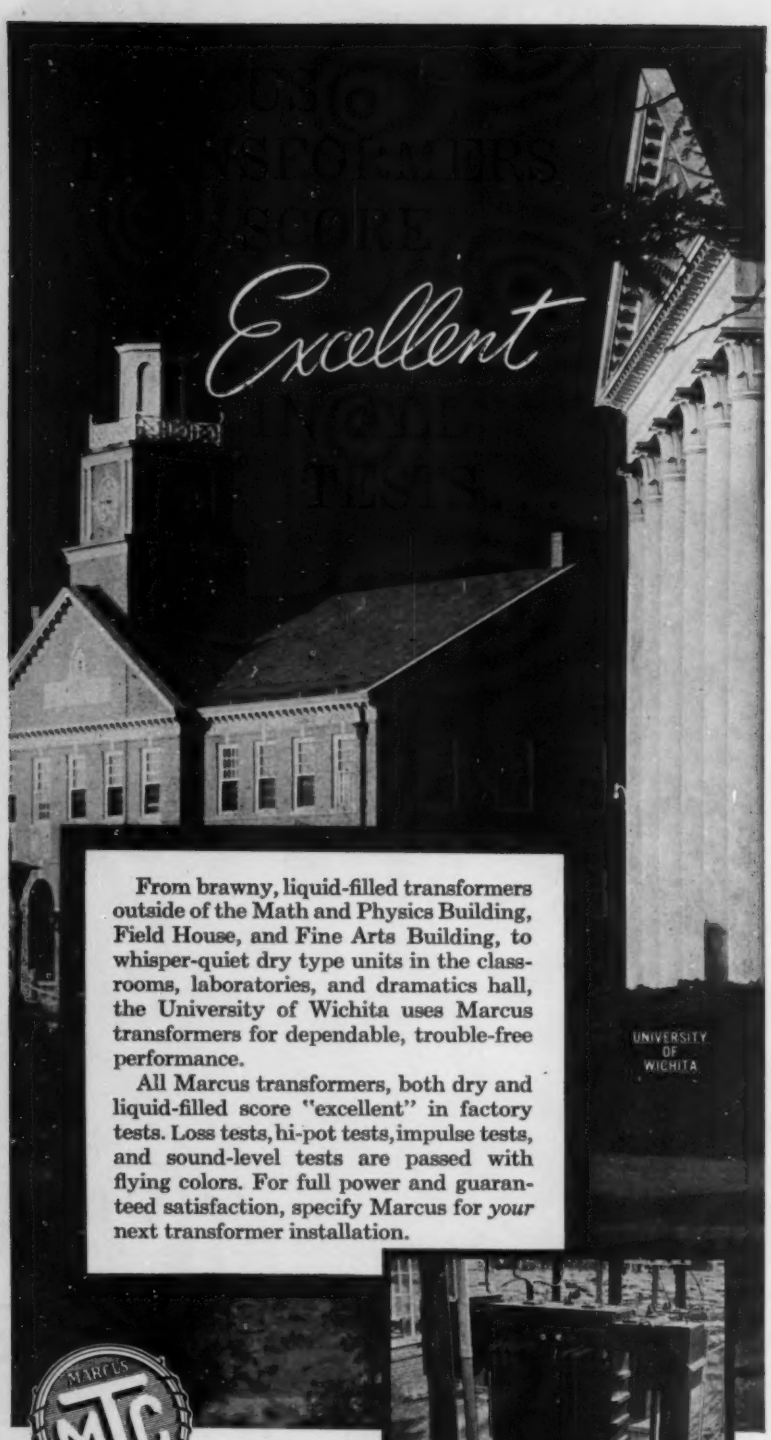

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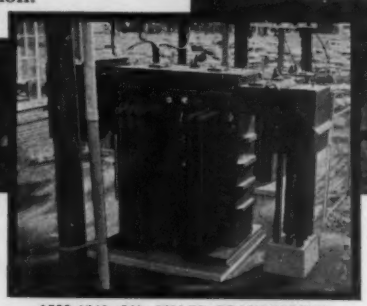

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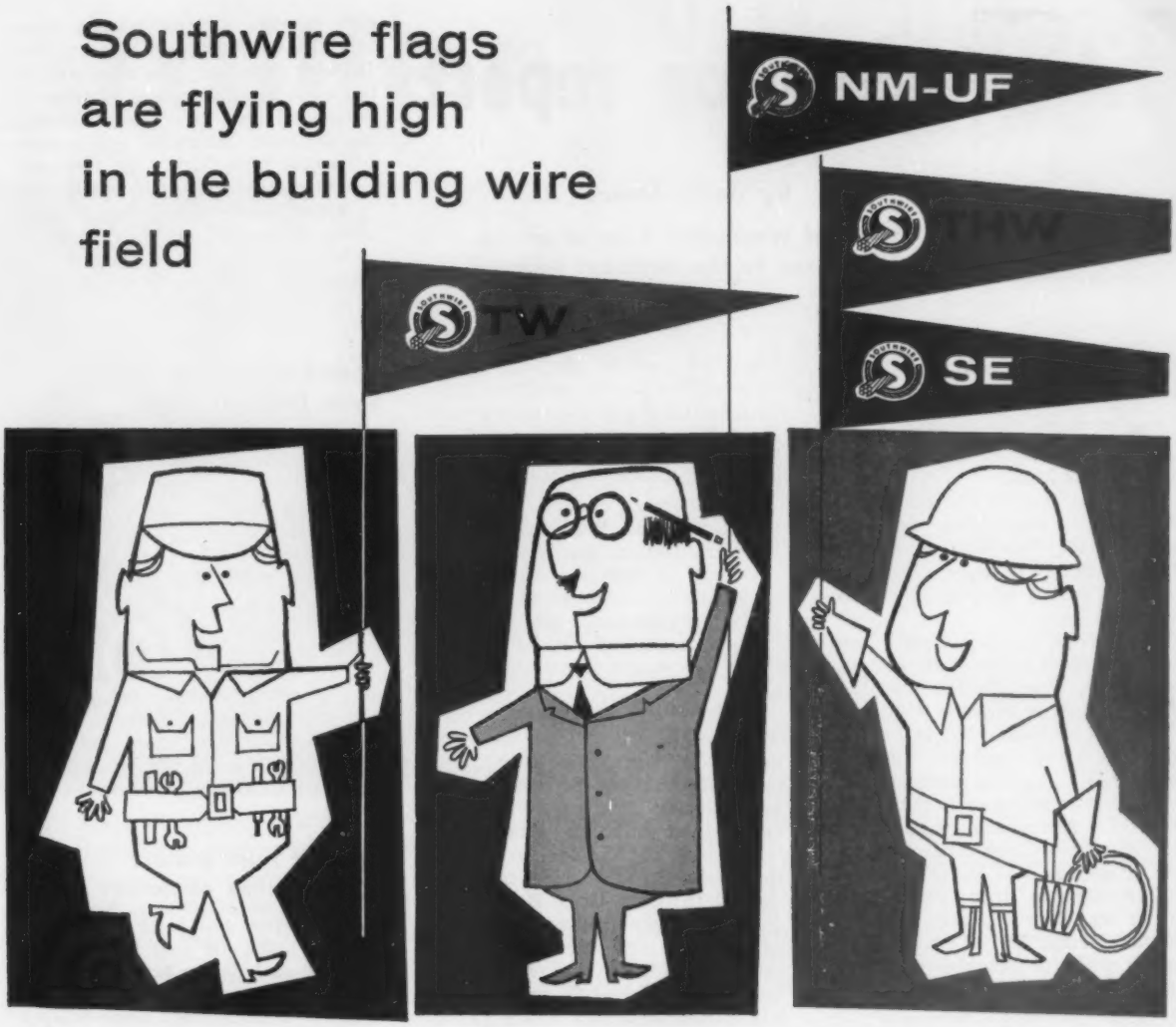

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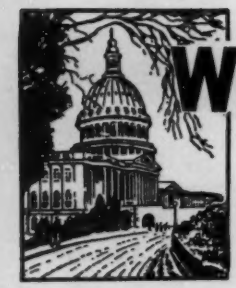

Washington report

By Jack James

Digest of Washington news of special significance to the electrical industry

IBEW approves charter for new Baltimore local

THE IBEW REVOKED the charter of Local 28 at Baltimore and chartered a new local.

At the time of this writing, most of the union electricians remained in Local 28. The local has asked the National Labor Relations board to certify it as an independent union.

Forty-four of the several hundred members of Local 28 were reported to have joined the new IBEW local as charter members. They will be loaned $25,000 by the IBEW to start the local. The new local was given the number "24."

The battle between Local 28 and the IBEW has simmered for years. For one period the local was under trusteeship of the IBEW.

The dispute that caused the break was over whether the local should strike for a contract renewal with the Maryland Chapter of the National Electrical Contractors Association or submit to arbitration by the Council of Industrial Relations for the Electrical Contracting Industry. The council is made up of representatives of the IBEW and the NECA.

The IBEW insisted that the contract renewal be submitted to arbitration. Local 28 refused. On June 19 Local 28 struck.

Chief issue in the strike is the insistence by the association (like the IBEW) that disputes be referred to the council—including contract renewals—and that a clause to this effect be in a renewed contract.

The IBEW backed the demand of the association. The IBEW said that this type of agreement has been a major factor in the labor peace of the electrical industry for 40 years.

Local 28, in addition to carrying on the strike, launched a fight in federal courts. A judge rejected a request from the local to enjoin the IBEW from revoking its charter. The judge also refused to hear Local 28 charges that the IBEW violated the Landrum-Griffin Act by establishing a trusteeship over the local until it had appealed to the IBEW appeal board on its ouster.

On another charge, that the IBEW violated the L-G Act attempting to take over Local 28 by revoking its charter, the judge said he could not decide until after the IBEW appeals board ruled.

In announcing new Local 24, IBEW President Gordon Freeman said:

"It is with encouragement then, that we issue a charter for Local Union 24, and know that under the leadership of you brothers who are charter members, that the goals of our union and its constitution, and the integrity of our brotherhood, will once more be upheld in the City of Baltimore."

Immediately following the announcement of the new local, wives, children, and infants of members of Local 28 appeared at IBEW headquarters. Their photo-carrying picket signs denouncing the IBEW appeared on the front page of the *Washington News*.

New construction rises one per cent in August

TOTAL NEW CONSTRUCTION rose one per cent in August, the U. S. Department of Commerce reports.

It was the normal seasonal rise from July and was four per cent ahead of the August 1960 level.

Private housing starts dropped one per cent from July. They were, however, four per cent ahead of August 1960.

Except for industrial construction, off ten per cent from August 1960, in all other categories construction ran ahead of last August.

For the first eight months of the year, new construction amounted to $37 billion. The figure was more than two per cent above that for the first eight months of 1960.

The rest of the nation's economy, which was hit harder than the construction industry by the 1958-59 recession, also appeared to be recovering. Personal income of Americans hit new peaks during the summer. Industrial production hit a new high during the summer.

Prospects for a further pick-up in housing throughout the country, also, appeared likely. One good indicator: requests for FHA mortgages rose in July to the highest level in 11 months.

Multi-family dwellings show five-year climb

FIVE YEARS AGO multi-family dwellings accounted for 15 per cent of new housing unit starts, but this year they will account for 25 per cent.

This is the report by the United Savings and Loan League. The league has traced a steadily rising trend in multi-family dwelling construction since 1956.

The trend may mean that a larger percentage of the housing market will go to union contractors. As a rule, contractors on large projects are more likely than not to have union agreements.

Specific rules protect service-called employees

WITH THE BUILD-UP of armed forces, some of your employees may be called into service.

Here is some general advice from a Washington labor lawyer on your duties:

On their return after discharge, if ex-servicemen reapply for jobs within 60 to 90 days (time limits vary depending on length and type of service) you must offer to reinstate them at the same pay, seniority, and status they would have acquired had they never left work.

Fringe benefits for ex-servicemen must be handled in the same way as they are for employees on leaves of absence. Each firm can follow its own policy in this respect.

Employers do not have to continue contributions to pension and welfare plans while employees are in service.

In World War II some firms did continue payments voluntarily. As more and more employees were called, costs mounted. The firms had to stop contributions. These firms were publicly stigmatized as unpatriotic. However, none of the firms that stopped payments at

(Continued on page 140)

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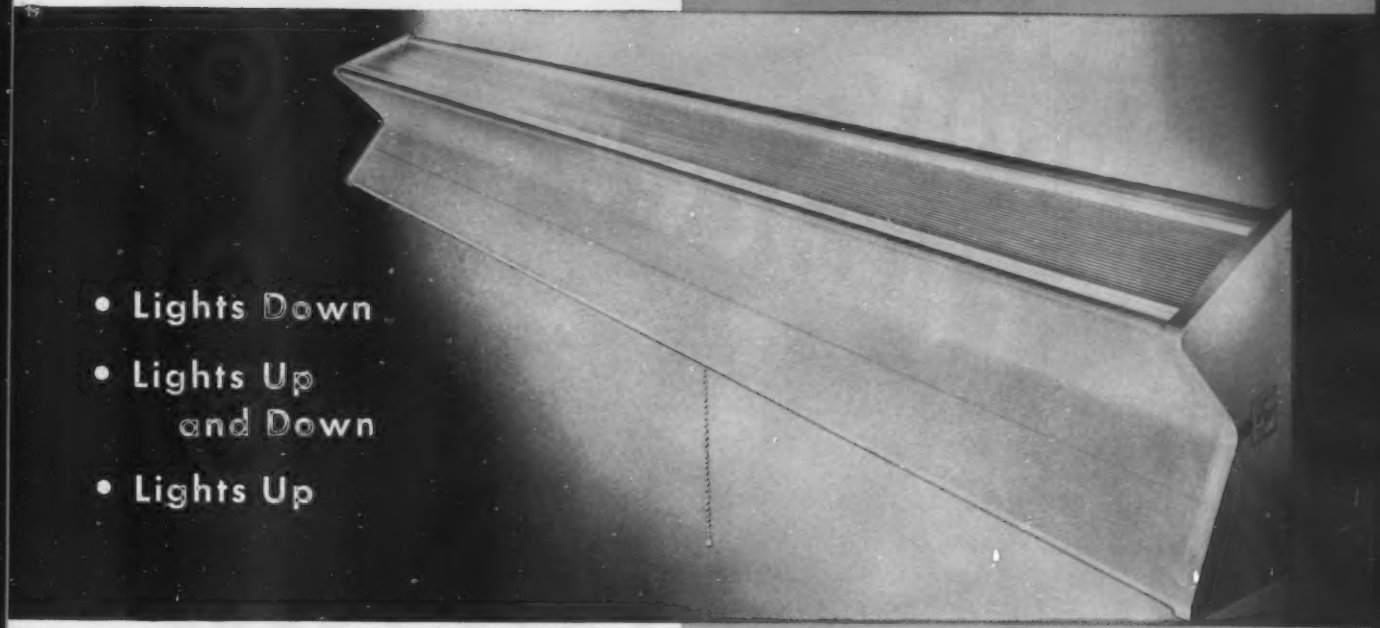

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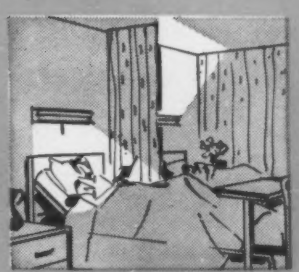
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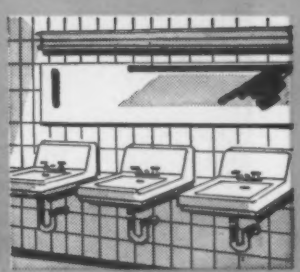
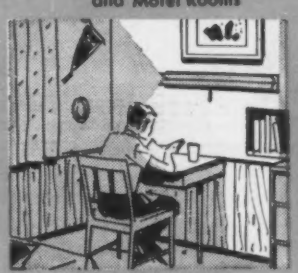
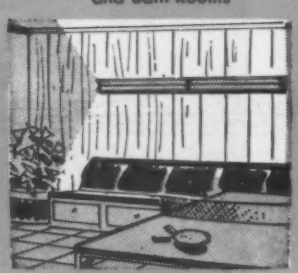
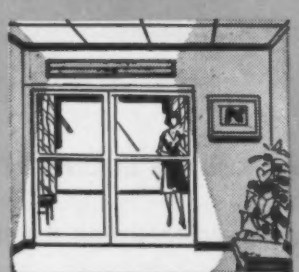

Wash Rooms and Bath Rooms


Home Study Areas


Recreation Rooms


Entryways

Stairwells

TAKE YOUR CHOICE!

combine
circuit breaker
FLEXIBILITY

PLUG FUSES
OR
CIRCUIT BREAKERS

exclusive by

SUITABLE FOR USE AS SERVICE EQUIPMENT

APPROVED FOR NON-INTERCHANGEABLE USE

NO MORE DOUBLE INVENTORY

NO MORE DOUBLE INVESTMENT

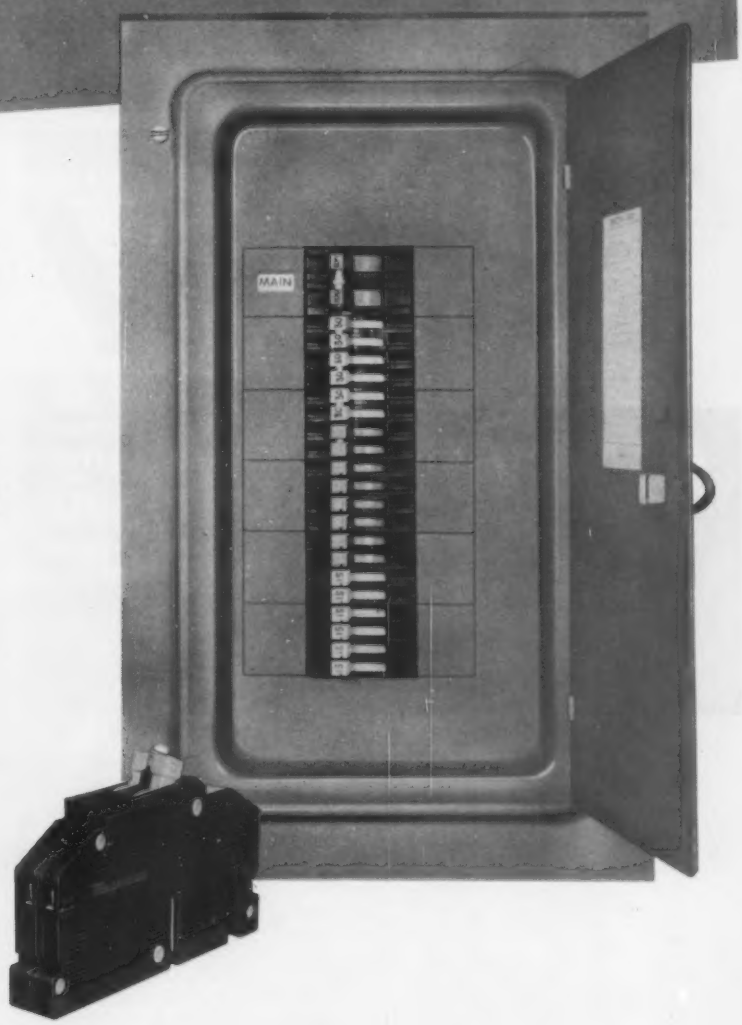
For more details on above items, use reply card on page 19

with plug fuse ECONOMY

PLUG-IN
FIELD INSTALLED
MAIN BREAKERS
COMMON TRIP
To 100 Amp

PLUG-IN
APPLIANCE CIRCUIT
TWIN SIZE BREAKERS
COMMON TRIP
To 40 Amp

PLUG-IN
LIGHTING CIRCUIT
PLUG FUSE UNITS
To 20 Amp



IN THE SAME ENCLOSURE

Linsco ELECTRICAL PRODUCTS

LOS ANGELES, CALIF.

DISTRIBUTION AND CONTROL EQUIPMENT SINCE 1932

ORIGINATOR OF THE PLUG-IN CIRCUIT BREAKER

Sales Offices in All Principal Cities

Warehouses in: Atlanta, Boston, Chicago, Dallas, Denver, New York (Stamford, Conn.), Oakland, Philadelphia, Pittsburgh, Portland, Richmond, Sacramento, St. Louis, Seattle

For more details on above items, use reply card on page 19

WHY

. . . and

MARKEL

GIVES YOU BOTH

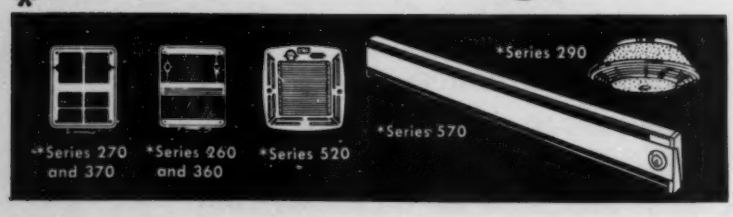
1 MARKEL Custom Line BASEBOARD with "ELCEE"

2 NEMA STANDARDS

1. The Automatic Watchdog Built-In Full Length Safety Sentry !
2. MARKEL* Custom Line conforms to new NEMA electric comfort heating equipment Quality and Performance Standards HE 2-1961 !

NEW! FREE! Write for your copy of the story of the NEW MARKEL Custom Line — the NEW MARKEL "ELCEE" and NEMA Quality and Performance Standards.

*



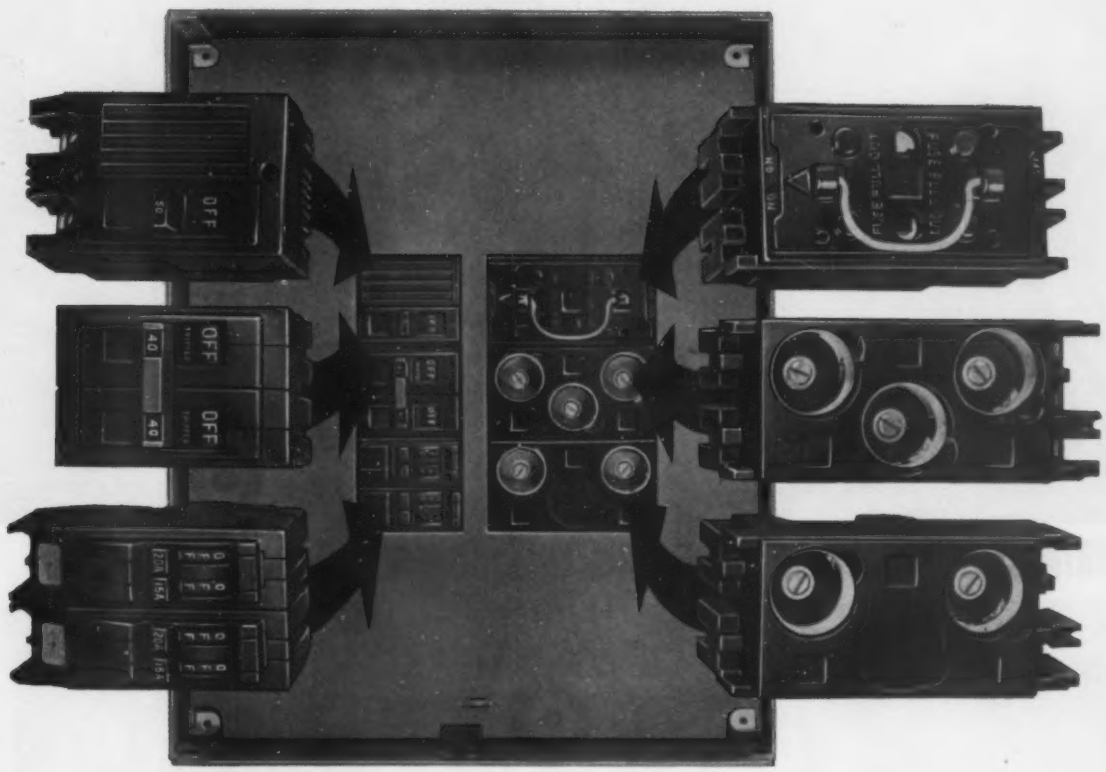
MARKEL
ELECTRIC PRODUCTS, Inc.
Founded 1920 • **BUFFALO 3, N.Y.**

IN CANADA:
Markel Electric Products, Ltd., Fort Erie, Ont.

WORLD'S LARGEST UNIT MANUFACTURER OF RESIDENTIAL ELECTRIC HEATING EQUIPMENT

NEW BREAKER/FUSE PANEL

Plug in breakers and fuses,
mount surface or flush
all with one basic box



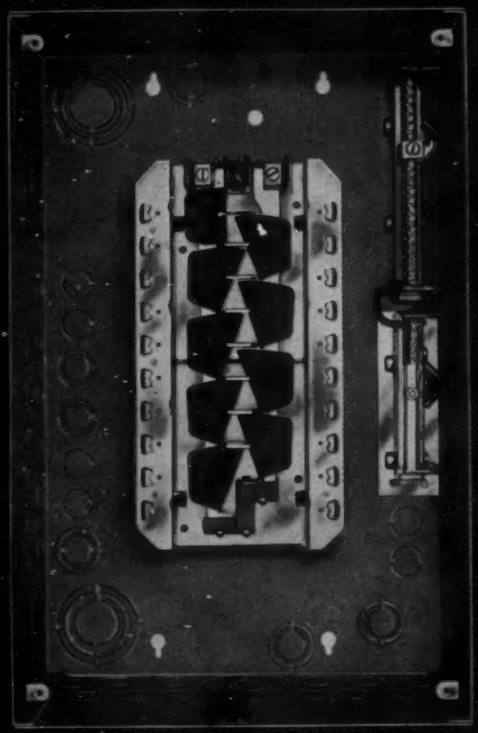
Now General Electric gives you the widest choice in service entrance equipment: "TWIN*" circuit breaker load centers... fuse puller panels and the new 4-in-1* Breaker/Fuse Panels.

*Trade Mark of General Electric Company.

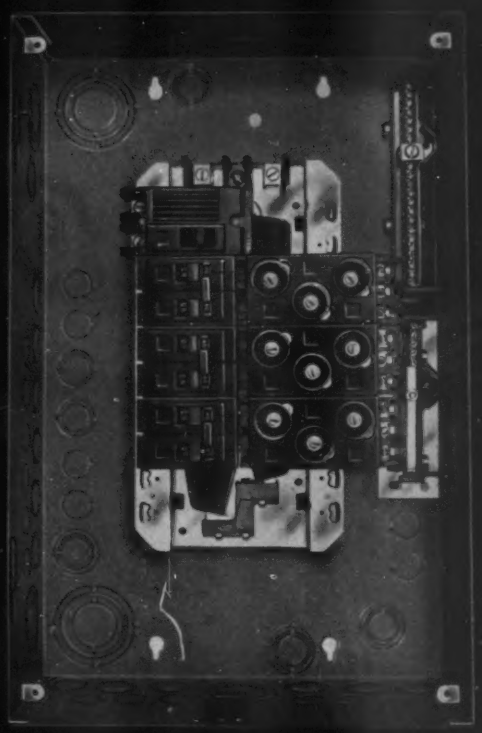
GENERAL ELECTRIC

For more details on above items, use reply card on page 19

SELECT ONE PANEL: PLUG IN

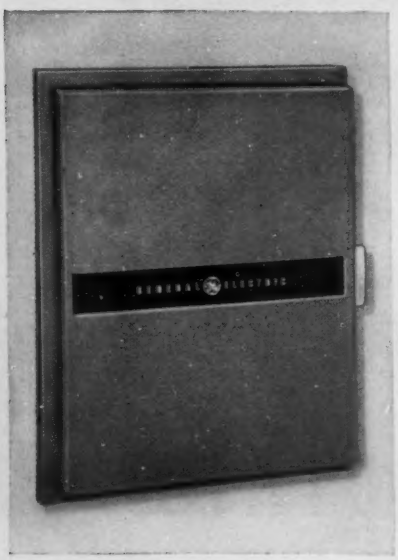


Typical Breaker/Fuse Panel . . . Cat. No. TP1612, shipped complete with box, front, interior; accepts *both* breakers and new G-E plug-in Fuse Blocks. Shown at right are three ways to assemble this panel.



Mix Breakers and Fuses . . . Cat. No. TP1612 with back fed 100-amp main breaker, three 2-pole TQL breakers, plus nine plug fuses—all in the same box. Only new G-E Breaker/Fuse Panels offer versatility like this!

COMBINATION ENCLOSURES - MOUNT EITHER SURFACE OR FLUSH

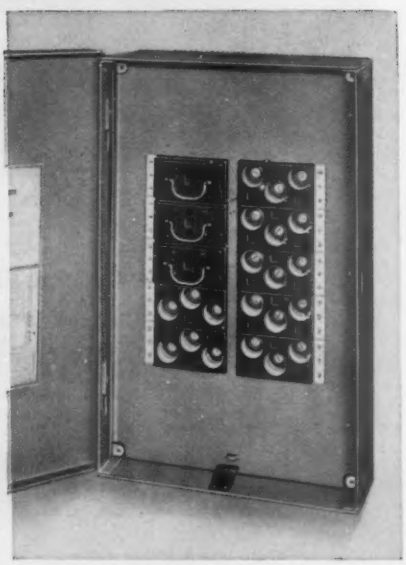


New Flush Frame Locks Around Box, Hides Rough Plaster, Assures Neat Job.

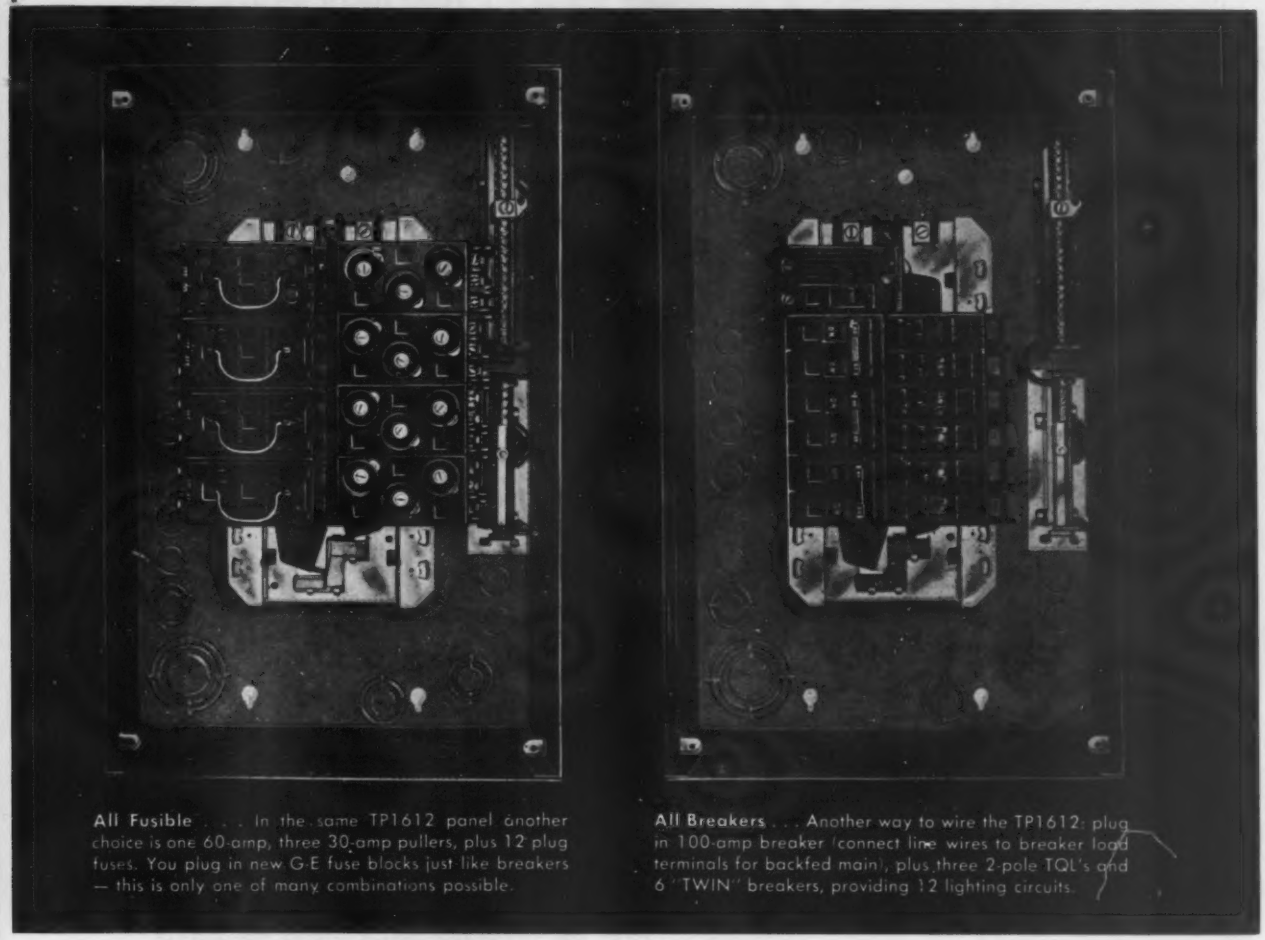
Here's dual mounting versatility: For flush installations, frame locks tight around box. Stud mounting ears automatically position box for ½-inch drywall — save time and labor . . . Nails quickly to studs.

For surface jobs, simply discard flush frame. It's as simple as that!

Complete Line 100, 125, 150, 200 amperes, 12 to 40 circuits. Main-lugs-only, split bus and main disconnect models cover full range of applications.



BREAKERS, FUSES...OR BOTH!



All Fusible . . . In the same TP1612 panel another choice is one 60-amp, three 30-amp pullers, plus 12 plug fuses. You plug in new G-E fuse blocks just like breakers — this is only one of many combinations possible.

All Breakers . . . Another way to wire the TP1612: plug in 100-amp breaker (connect line wires to breaker load terminals for backfed main), plus three 2-pole TQL's and 6 "TWIN" breakers, providing 12 lighting circuits.

A BOLD NEW APPROACH TO VERSATILITY...

Basic 4-in-1 Idea: With a single catalog number you order a combination flush-surface panel which accepts plug-in breakers, fuse blocks or both!

Wide Choice of Plug-in Units: Breaker/Fuse Panels accept any combination of these plug-in units . . .

- 30- and 60-amp fuse pullers (horsepower rated)
- 2- and 3-circuit plug fuse blocks
- 2-pole circuit breakers, 10 to 100 amperes
- Single-pole TQL and "TWIN" circuit breakers

Bonus Installation Time-Savers: Snap-out front shield; stud mounting ears; reversible box and front; spring-mounted, snap-out interior; removable door; full sequence phasing. All panels are U/L listed and meet NEC non-interchangeability requirements. Available now from your General Electric distributor. Circuit Protective Devices Dept., General Electric Co., Plainville, Conn.

GENERAL ELECTRIC

For more details on above items, use reply card on page 19

New! SPANG BLUE STAR CONDUIT

Now—from SPANG comes a new improved galvanized rigid steel conduit. Here's what it offers you:

NEW —*best thread protection available against rust*

. . . a smooth, uniform zinc galvanized coating on every ridge and valley of every thread . . . easy coupling—can be hand tightened the whole way . . . no thread chasing . . . no excess zinc . . . Preece-tested to assure quality and dependability.

NEW —*double galvanized coating on the conduit for extra corrosion resistance*

. . . inhibits white rust formation . . . eliminates flaking of finish . . . has that fine SPANGLEAM appearance.

NEW —*better packaging for easier handling*

. . . bundled in steel strapping in sizes up through 2" . . . shipped on a one-ton rectangular lift for convenient transit by lift truck...cuts handling costs—makes inventory easier.

★ ★ ★

Save installation time, get top protection against rust and corrosion with new SPANG Blue Star Galvanized Rigid Steel Conduit. See your nearby SPANG Distributor for complete details and samples.

SPANG Blue Star Conduit is one of the many fine products produced by *National Supply Division, Armco Steel Corporation, Two Gateway Center, Pittsburgh 22, Penna.*

ARMCO National Supply Division

INFORMATION CENTER

Help yourself to free literature and more details on any products mentioned in this issue.

Instead of writing a dozen different manufacturers for free literature and more information on products, equipment, or services, just insert on the cards below the appropriate key numbers of the items in which you are interested. These cards may be used to get information on products mentioned in the following departments (see Contents Page for page number):

Catalogs and Bulletins — New Electrical Products
New Utility Equipment — Advertisements

Be sure to print or write legibly your name and address—drop it in the nearest mail box and

ES pays the postage!

OCTOBER, 1961

Send free information on these NEW PRODUCTS and/or services (fill in key numbers):

_____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____

Send this FREE LITERATURE (fill in key numbers):

_____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____

Send free information on these ADVERTISEMENTS:

Company..... Page..... Company..... Page.....
Company..... Page..... Company..... Page.....

My Name ..... Position.....
My Company's Name .....
Address (number and street) .....
City ..... Zone..... State.....

OCTOBER, 1961

Send free information on these NEW PRODUCTS and/or services (fill in key numbers):

_____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____

Send this FREE LITERATURE (fill in key numbers):

_____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____
_____ _____ _____ _____ _____ _____

Send free information on these ADVERTISEMENTS:

Company..... Page..... Company..... Page.....
Company..... Page..... Company..... Page.....

My Name ..... Position.....
My Company's Name .....
Address (number and street) .....
City ..... Zone..... State.....

These cards can help you get valuable information

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed In the United States

BUSINESS REPLY CARD
FIRST CLASS PERMIT NO. 582, SEC. 34.9, P. L. & R., ATLANTA, GA.

Electrical South
1760 PEACHTREE ROAD, N. W.
ATLANTA 9, GEORGIA

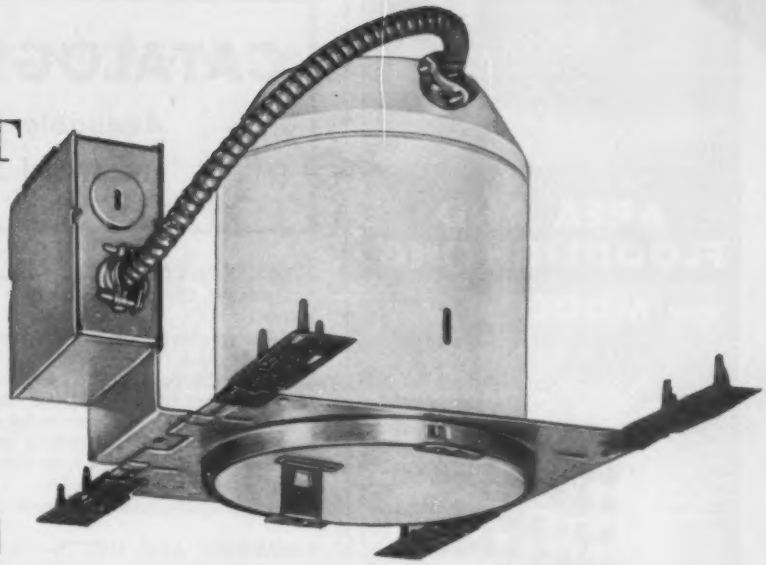
Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed In the United States

BUSINESS REPLY CARD
FIRST CLASS PERMIT NO. 582, SEC. 34.9, P. L. & R., ATLANTA, GA.

Electrical South
1760 PEACHTREE ROAD, N. W.
ATLANTA 9, GEORGIA

New MOE LIGHT round recessed housing



PREWIRED NO. M-6000 • UNWIRED NO. M-6001

GET ONE FREE FOR EACH ONE YOU BUY!

EASY TO MOUNT. Housing mounts quickly to plaster frame. For fast removal, make one quick twist at keyhole on each side of housing.

FITS TIGHTLY, ADJUSTS EASILY. Plaster frame assures tight fit, permits adjustment of housing *after* installation.

ADJUSTABLE FOR 75, 100, 150 WATT LAMPS. Reflector and socket adjust quickly, easily—keep reflected heat from fixture.

SNAP-ON BAR HANGERS mount quickly to plaster frame. No tools needed.

EASY TO WIRE AND INSPECT. Snap-open covers on both sides of outlet box permit fast wiring and inspection of pre-wired housing.

And just look at the choice of trim and glass styles!

TAKE THIS COUPON TO YOUR MOE LIGHT DISTRIBUTOR

This coupon entitles the bearer to one new MOE Light round recessed housing free for each one of same model number purchased. This offer does not apply to purchase of trims or glass. Act now, offer expires Oct. 31st.

MOE LIGHT

MOE LIGHT DIVISION
Thomas Industries Inc.
207 E. Broadway, Dept. OES
Louisville 2, Kentucky

For more details on above items, use reply card on page 19

CATALOGS and BULLETINS

Available Free To Readers of Electrical South upon Request

TAKE YOUR CHOICE—You can now install Circuit Breakers or Plug Fuses or both in the same loadcenter enclosure. New Product Bulletin NPB-131 issued by Zinsco Electrical Products 729 Turner St., Los Angeles 12, Cal., describes how Circuit Breaker flexibility can be combined with Plug Fuse economy to reduce inventory and investment for both the Distributor and the Contractor.

Write in No. A134 on card, p. 19

CONDUIT AND DUCTS—Orangeburg Mfg. Co., Inc., 375 Park Ave., New York 22, N. Y. has made available informative literature. Catalog No. 52 includes complete details concerning advantages, installation, and properties of Orangeburg fibre conduit, standard conduit—type I, and Nocrete conduit—type II. Catalog 202 offers specifications, installation data, and diagram of the complete Orangeburg Underfloor duct system. Descriptions and catalog numbers of components are also given.

Write in No. A135 on card, p. 19

ELECTRIC HEATING—A 34-page descriptive packet containing color illustrations and complete specifications of eight major types of electric heating units and controls is now available from Arvin Industries, Inc., Electric Heat Div., 13th and Big Four Road, Columbus, Ind. Both radiant and fan-forced heaters are included, in wall, baseboard, and ceiling models.

Write in No. A136 on card, p. 19

WIRING DEVICES — Catalog No. 60, and New Product Bulletins, containing the complete electrical wiring device line of Leviton Mfg. Co., Inc., Brooklyn 22, N. Y. Over 170 pages accurately illustrated and containing electrical and circuit wiring diagrams. Complete cross index for easy reference. Featured are Specification Grade Devices, Interchangeable, Lev-o-Lock, and Snap-In lines, and many, many others; devices for every possible use in Industrial, Commercial and Residential application.

Write in No. A137 on card, p. 19

CARBON PRODUCTS—A 28-page catalog on Motor and Generator Brushes and carbon products telling how to order brushes, grade recommendations, characteristics, and description of brush grades, is available from the Helwig Co., 2536 North 30th St., Milwaukee, Wis.

Write in No. A138 on card, p. 19

LIGHTING FIXTURES—Progress Manufacturing Co., Castor Avenue and Tulip Street, Philadelphia 34, Pa., announces the publication of two new lighting catalogs. "Lighting by Progress," a 52-page booklet, describes their line of residential fixtures. "Home Lighting by Minute Mount" is a 12-page bulletin illustrating new ideas in budget lighting.

Write in No. A139 on card, p. 19

CABLE, WIRE, AND CORD—Catalog 71A, punched for filing in looseleaf binder, has been made available by Carol Cable Co., Division of the Crescent Co., Inc., Pawtucket, R. I. Contained in its 24 pages is a complete listing of most of the types of wire and cable offered by the firm.

Write in No. A140 on card, p. 19

ELECTRICAL EQUIPMENT—The Wadsworth Electric Mfg. Co., Inc., Covington, Ky., has issued a new catalog 58' Guide, containing data on their line of Safety Switches, Service Equipment, Distribution Panels, "E-Z-RED" Circuit Breakers, interchangeable and non-interchangeable, also wiring troughs.

Write in No. A141 on card, p. 19

POWER BENDER — The light weight hydraulic power bender #884, manufactured by Greenlee Tool Co., of Rockford, Ill., is described in a new bulletin issued by the company.

Write in No. A142 on card, p. 19

ELECTRICAL FITTINGS—Concise 36-page catalog illustrates and describes a complete line of electrical fittings, cable racks and wiring specialties. The catalog contains many detail drawings, clear-cut photographic illustrations of mast fittings, cable connectors, traps, hangers and ground clamps in a wide variety of types and sizes. For your free copy, write The M. & W. Electric Mfg. Co., East Palestine, Ohio.

Write in No. A143 on card, p. 19

COMPRESSION CONNECTORS — New and fully illustrated Bulletin 13 offered by the James R. Kearney Corp., 4236 Clayton Ave., St. Louis 10, Mo., shows their complete line of Squeezon compression fittings. They make all overhead distribution connections from line wire to ground rod on aluminum, ACSR, copper, or

KNOW YOUR SYMBOLS

This symbol stands for fusible switch

This symbol stands for QUALITY

THE SAFETY SWITCH THAT CHALLENGES COMPARISON . . .

BullDog's general-duty safety switch!

- **Minimum arcing—double break switching**
- **Arc control—Vacu-Break® principle**
- **Pressure contacts—Clampmatic® spring action**
- **Positive switching—direct handle operation**
- **Front operation—permits ganging**

. . . plus, all current-carrying parts are silvered. Available in NEMA 1 and NEMA 3R enclosures . . . competitively priced. Challenge our distributors to prove these switches are the finest. Write for details!

Contact the I-T-E Office in your locality for additional product information and service.

BullDog Electric Products Division, I-T-E Circuit Breaker Company, Box 177, Detroit 32, Michigan. In Canada: 80 Clayson Rd., Toronto, Ont. Export Division: 13 East 40th St., New York 16, N. Y.

I-T-E CIRCUIT BREAKER COMPANY
BULLDOG ELECTRIC PRODUCTS DIVISION

For more details on above items, use reply card on page 19

CATALOGS and BULLETINS

Available Free to Readers of Electrical South upon Request

combinations of them. Application and installation data are given for tap connectors of several types; service entrance, splicing, jumper and repair sleeves; terminals, stirrups and ground fittings. Mechanical and hydraulic installing tools for both dead and hot line work are listed.

Write in No. A145 on card, p. 19

WATER HEATING BOILER — Precision Parts Corp., 400 N. First St., Nashville 7, Tenn., has available a bulletin containing catalog information on their electric hot water heating boiler, diagrams of the boiler, and data on the advantages of its use. The boiler comes complete with water circulator and safety valve on models A through K.

Write in No. A146 on card, p. 19

ADEQUATE WIRING — "Bright Ideas for Ladies" is the title of a new booklet from American Metal Moulding Co., 146 Coit St., Irvington 11, N. J. The booklet was prepared by the Armoured Cable Section of the National Electrical Manufacturers Association to acquaint homemakers with the electrical wiring their homes need for full electrical living now and in the future.

Write in No. A147 on card, p. 19

ELECTRICAL CONDUITS — "National Electric Conduits" is the 20-page Catalog No. 603 which describes and illustrates the many types of electrical conduits manufactured by National Electric Div., H. K. Porter Co., Porter Bldg., Pittsburgh 22, Pa.

Write in No. A148 on card, p. 19

TRANSFORMERS—R T & E Corp., 1900 E. North St., Waukesha, Wis., has available a bulletin describing Terra-Tran transformers for residential underground distribution. The 15-page booklet is illustrated and contains complete information on construction, application, and design features.

Write in No. A149 on card, p. 19

ANCHORING DEVICES—An Illustrated 32-page catalog, No. 70, describing more than 25 anchoring and drilling devices for making fastenings to masonry, is available from the Arro Expansion Bolt Co., Marion, Ohio.

Write in No. A150 on card, p. 19

CONNECTORS — Comprehensive, up-to-date information on electrical connections for overhead lines in transmission and distribution is now available in one convenient publication, a 10-page manual issued by Burndy Corp., Norwalk, Conn., on connection techniques, connectors, and installation tooling.

Write in No. A151 on card, p. 19

ELECTRIC HEATING — Electromode Division of Commercial controls Corp., 570 Culver Rd., Rochester 3, N. Y., is now offering their complete line of electric heaters and heating systems for the home. Descriptions, specifications and illustrations are included for wall and portable heaters for large and small rooms, radiant panel heaters, baseboard heaters and radiant cable heat.

Write in No. A152 on card, p. 19

ELECTRICAL EQUIPMENT — A new 12-page pictorial bulletin briefly describes manufacturing facilities and electrical products of Crouse-Hinds Co., Syracuse 1, N. Y. Emphasis is on the variety of equipment available in the four product lines; Condulet electrical equipment, floodlights, aviation lighting equipment, and traffic control.

Write in No. A153 on card, p. 19

CONNECTOR BULLETINS — Six new bulletins have been released by Ilsco Corp., 4730 Madison Rd., Cincinnati, Ohio. They cover the Ilsco line of solderless connectors, special connectors, lugs, neutral bars, crimp lugs, and the Ilsco Lok-A-Blok. The bulletins include descriptive material, dimensions, and packaging data.

Write in No. A154 on card, p. 19

WIRE PULLING LUBRICANT — Illustrated six-page folder showing the advantages of an improved Y-Er Eas wire pulling lubricant is available from Electro Compound Co., 4145 W. 150th St., Cleveland 11, Ohio.

Write in No. A155 on card, p. 19

FLUORESCENT FIXTURES—The new Miller Sabre fluorescent fixture is illustrated in the Sabre catalog, page 13, published by The Miller Company, Meriden, Conn. This page points out application, construction details, and dimensional, illumination, and installation data.

Write in No. A156 on card, p. 19

TROFFER CATALOG—A 36-page catalog, with complete information on their newly re-designed architectural troffers has been released by Smithcraft Lighting Division, Chelsea, Mass. Divided into sections for selection of lighting units, the catalog gives complete illustrations and data for 1 and 2 foot troffers in all types of ceiling construction. Also included in the catalog is information on ceiling lighting patterns, shielding designs, lighting techniques and applications.

Write in No. A157 on card, p. 19

CONSTRUCTION ANCHORS — "Anchoring for Power and Communication Lines," a completely illustrated manual on improving line construction with better anchoring, has been published by the Advertising Dept., the A. B. Chance Co., Centralia, Mo. The 25-page booklet shows how to install the right anchor at the right place in the right way.

Write in No. A158 on card, p. 19

SMALL WIRE STRAPS—Added to the one-hole Viking strap line are three new Midget straps for small wires. The #616 for fastening RX and UF 2/14, 2/12, and BX 2/14; the #416 for wires to ¼" OD; and #316 for wires of 3/16" and ¼". These galvanized straps, designed to take several sizes of wires; are featured in literature released by W. W. Cross & Co., Viking Cable and Fastening Devices, Greenville, R. I.

Write in No. A159 on card, p. 19

RESIDENTIAL LIGHTING — A new catalog featuring their line of residential lighting fixtures has recently been issued by John C. Virden Co., 6103 Longfellow Ave., Cleveland 3, Ohio. The 48-page booklet is illustrated and in color. It pictures and describes incandescent and fluorescent fixtures for every room in the house and every design motif.

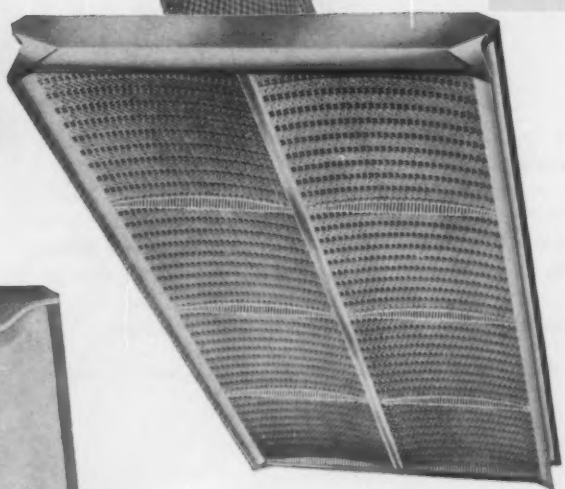
Write in No. A160 on card, p. 19

QPLM6500 for thin-lined architectural appeal.

QPCX7400 "Wrap-around" all-plastic enclosure.

QRH7500 (Sculpturama®) with all-curved styling.

QUICK CHANGE LIGHTING



QP8500 (Shallorama®) pioneer in shallow surface-mounted lighting.

Investigate how Sunbeam Lighting today can save tomorrow!

Adaptability for future change is a basic design principle in back of Sunbeam Lighting fixtures. For instance, when you specify and install the ultra-shallow, surface-mounted Visionaires® #6500, #7400, #7500 or #8500 you are automatically planning ahead. The diffusers to these versatile series are all interchangeable. They give the building owner a wide choice of 16 different lighting possibilities when planning alterations. He might select QP8500 (Shallorama®) because of its recessed look and wide light distribution, QRH7500 (Sculpturama®) with the sculptured look and which is unexcelled in low brightness control or the QPCX7400 ("Wrap-around") with exclusive SUNLUX® plastic enclosure for soft diffusion. A quick change in lighting is as simple as the unique, tool-free, "hook-on" hinging arrangement can make it. Merely change the framed diffuser!

SUNBEAM LIGHTING COMPANY

777 East 14th Place, Los Angeles 21, California — 3840 Georgia Street, Gary, Indiana

For more details on above items, use reply card on page 19

A brand new jacket for Ettco Flex

The all-new Ettco Flex* non-metallic sheathed cable (Type NM) is now P.J. (plastic jacketed).

The new Ettco-Flex P.J. is the first completely new product of its kind in the cable industry for over a quarter of a century. This is a result of ETTCO's constant research and development.

New Ettco-Flex is better by far because it features . . .

- Much smaller diameter than any competitive product.
- Easier stripping.
- No messy paper wraps.
- No sticky saturants.
- Extremely smooth and easy pulling through joists and beams (no snagging or ripping of plastic jacket).
- All sizes with and without ground wire.
- Packaging in new convenient white carton.

See and "Feel" the new Ettco-Flex P.J. at your local distributor.

*PATENT PENDING

ETTCO WIRE & CABLE CORPORATION

OFFICES: 46-50 METROPOLITAN AVENUE • BROOKLYN 37, NEW YORK

PLANT: 75 ONDERDONK AVENUE • BROOKLYN 37, NEW YORK

MODULAR LIGHTING—A twelve-page folder describing and illustrating their line of surfaced and recessed fluorescent modular fixtures is announced by Moe Light of Thomas Industries, Inc., Lighting Division, Brook & Broadway, Louisville, Ky. Complete coefficient of utilization and candlepower distribution tables are included for each set of fixtures.
Write in No. A161 on card, p. 19

BUILT-IN HEATERS—Thermador Electrical Manufacturing Co., 5119 District Blvd., Los Angeles 22, Calif., has announced the availability of three new catalog sheets on their line of built-in electric heaters. The heaters described are their portable radiant-fan heater, electric ceiling heater, and baseboard electric heater.
Write in No. A162 on card, p. 19

CABLE SUPPORTING TRAYS — The Globe Co., 4000 South Princeton Ave., Chicago 9, Ill., has made available a new catalog on their line of cable supporting tray systems and accessories. The catalog contains information on design features, specifications, and installation.
Write in No. A163 on card, p. 19

CONDUIT — With Rigid Polyvinyl Chloride Electrical Conduit gaining increasing popularity in the electrical field, Kraloy Plastic Pipe Co., Inc. offers a new, complete 20-page catalog. Included are comprehensive test results, specifications information, installation instruction, corrosion resistant charts, and other valuable data. Write Kraloy Plastic Pipe Co., Inc., Electrical Conduit Division, 402 West Central Avenue, Santa Ana, California.
Write in No. A164 on card, p. 19

SWITCH & OUTLET BOXES AND ELECTRICAL FITTINGS — Catalogs B-960 and F-960 respectively feature the latest in switch and outlet boxes and electrical fittings. Completely illustrated, they contain over 100 pages of technical and informational data. A unique set of indexes in the fittings catalog make it the easiest reference catalog in its field. Available from the Electrical Fittings Corp., 37-50 57th St., Woodside 77, New York.
Write in No. A165 on card, p. 19

LIGHTING FIXTURES — An extensive catalog containing bulletins on a wide variety of commercial, industrial, and residential lighting fixtures of both the incandescent and fluorescent types is now available from L & P Lighting, P. O. Box 157, Olive Branch, Miss. Illustrations, diagrams, and data charts are included, along with application suggestions.
Write in No. A166 on card, p. 19

Bring out the best in Electric Heating with Honeywell quality controls

The new Honeywell T462 Line Voltage Thermostat offers the very finest for your economy-minded customers. A beauty in any room, this compact new thermostat gives dependable, worry-free performance—high load capacity plus accuracy and responsiveness. The new T462 was especially developed for electric heating, with a control range from 40°-85° with less than one-half degree differential. The T462 offers everything you could ask for in a quality-built line voltage thermostat.

Honeywell

First in Control

SINCE 1885

T462A—SPST Switching With Manual Single-Line Break in "No-Heat" Position.
T462B—SPST Switching With Manual Double-Line Break in "Off" Position.
For complete data on these and the complete line of low voltage controls, write Honeywell, Department ES-10-13, Minneapolis 8, Minnesota.

For more details on above items, use reply card on page 19

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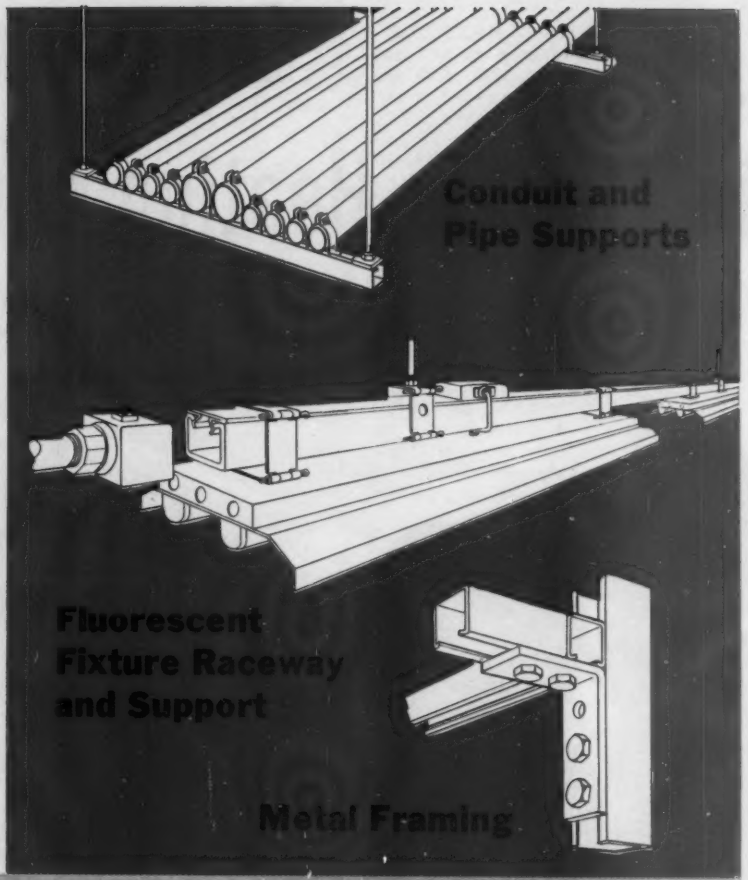
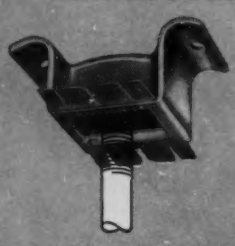
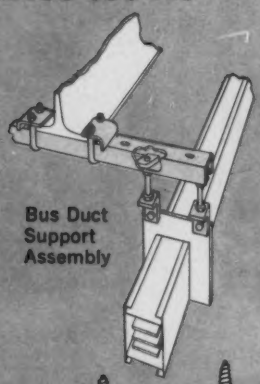
THE KINDORF METHOD
GALV-KROM FINISH
An electrogalvanized finish
PLUS added protection of zinc chromate



and accessories too . . .


D-255 Concrete Insert

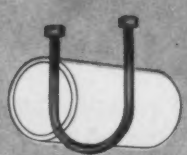

Bus Duct Support Assembly

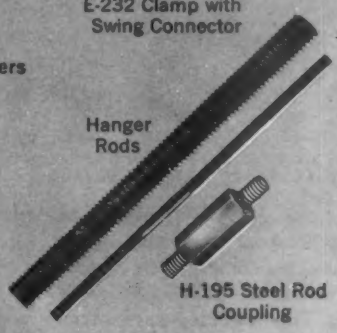
C-149 Series Conduit Hangers

E-232 Clamp with Swing Connector

C-247 Conduit Clamp

E-243 Wood Beam Support Flange


H-286 Series U-Bolts


Hanger Rods

H-195 Steel Rod Coupling

SOLD THROUGH WHOLESALE DISTRIBUTION ONLY

Refer to Sweets Catalog files or write for product information

Write for new Steel City Handbook

STEEL CITY ELECTRIC COMPANY
A subsidiary of American Metal Products Company
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For more details on above items, use reply card on page 19

STEBER QUARTZLITERS-

SCIENTIFICALLY DESIGNED FOR

- Maximum controlled light output
- Efficient operating temperature
- Economical **first-cost** versus **light-output** ratio
- **Versatility** of application

Design objectives have been accomplished in the STEBER 7000 series **Quartzliters** through the choice of ideal dimensions, beam spreads, method of cooling and materials that assure long life with minimum maintenance expense.

You get true, full performance from the new 500 and 1500 watt Quartz-Iodine lamps when you use STEBER Quartzliters.

Metal to metal contact cooling. Reflector nests in contact with internal fins which conduct heat to outer fin surfaces.

Yoke mounting with choice of brackets.

Wide, medium and narrow beam spreads to suit all applications for lighting: building facades, signs and poster boards, parking areas, golf driving ranges, race tracks, sports areas, amusement parks, playgrounds, loading docks, outdoor construction.

- Cast aluminum, dual-fin cooled
- Aluminum Anodal reflectors
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Swivel Mounting
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Surface
or
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SQUARE

Vandal-Proof
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Weather-Resistant

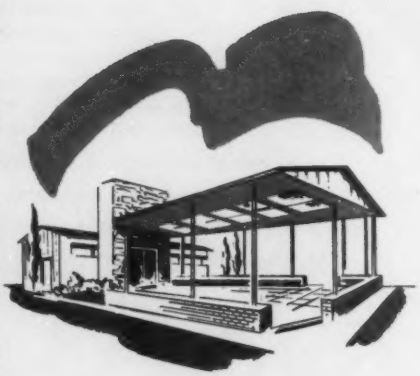
The Delta "PC-150"— The Ideal Light For Public Buildings and Areas

The PC-150 is a tamper-proof, vandal-proof lighting fixture specifically designed for use in public buildings and areas. The fixture accommodates up to two 100-watt A lamps in its double 14-gauge steel housing.

The steel mesh, welded to the outer housing, protects the Corning fresnel lens against vandalism. Theft is made difficult by spanner-head screws requiring a special screw driver for access to lamps.

Other safety items include the seating of the lens in a shock-absorbing foam-rubber gasket, a fiber-glass insulation between the fixture and the ceiling, and a safety chain to hold the outer steel housing to the inner housing to facilitate re-lamping.

All component parts of the PC-150 are phosphate-coated for rust prevention and better adhesion of white-baked synthetic enamel finish. Other colors are available.



L & P LIGHTING

LIGHT & POWER UTILITIES CORP.
Olive Branch, Miss.
1035 Firestone Blvd., Memphis, Tenn.
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DELTA

L & P Lighting Serves Its Agents

L & P's "partnership in business" begins with its own agents. They are the vital link between L & P, as manufacturer of fluorescent and incandescent lighting fixtures . . . and the distributors and their customers. For this reason, our agents are always welcome at the L & P plants in Olive Branch, Miss., and Memphis, Tenn. In fact, we make it a point to see that they visit us from time to time.

As a result, you'll find L & P agents know their products exceptionally well, from knockouts to ballasts, from lumens to louvers. You'll find that L & P agents are proud of their fixtures, too—for they know from personal experience that only the best of craftsmanship, materials, and performance emerge from the L & P assembly lines.

WHATEVER YOU NEED IN LIGHTING FIXTURES, ASK YOUR L & P AGENT. HE IS TRAINED, EXPERIENCED, AND DEDICATED TO SERVE YOU. YOU CAN TRUST HIM.

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In every profession, one instrument gets to the heart of the problem quickest, easiest, and most accurately. Amprobe is the stethoscope of the electrical industry

The Amprobe RS-3* enables you to take voltage, current and resistance readings to help diagnose electrical "ills." It saves you time and effort; it adds to your reputation for ability and service. Here are a few typical applications. Ask your distributor or write today for more details: ■ determine current loads of power equipment ■ make commercial and industrial load surveys ■ identify unmarked motor terminals ■ test for low-voltage conditions ■ check resistance in solenoid coils. *Only $52.50 (slightly higher outside U.S.).

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The Industry's Best Buy In Safety, Performance, Durability

LIGHTING PANELBOARDS
Plug-In or Bolt-On Circuit Breaker Types.

S-A-W DISTRIBUTION PANELBOARDS
Last Word in Heavy Duty Fusible Protection.

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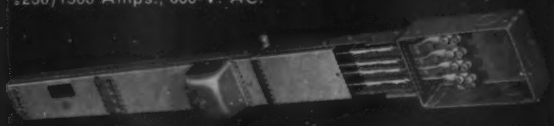
Plug-In Outlets 10" Centers.
250/1500 Amps., 600-V. AC.



MIDGET BUSDUCT
Extends Busduct System for Less Than Wire, Cable and Labor Costs. 100 Amps. Unfused, Fusible or Breaker Plug-In Units.

NON-COMBINATION
Starter and Fusible Switch Assembled.

COMBINATION
Single Enclosure With Starter and Switch or Starter and Breaker.

PLUG-IN MOTOR STARTER UNITS
Plugs into Panelboards or Switchboards. Eliminates Separate Motor Controls.

No matter what the size and complexity of the project—no matter if the need is for the largest switchboard or the smallest safety switch—the Frank Adam name upon it is a warranty of unsurpassed quality and craftsmanship, protection and durability.

Give your clients every benefit in safety, dependability and economy of the "industry's finest"—specify, insist on, Frank Adam Electrical Equipment.

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KEEP PACE ELECTRICALLY — THE PRODUCERS COUNCIL

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...with USS Amerzone-B insulation*

Amerzone-B butyl rubber insulation can be safely operated continuously at 90°C copper temperature. This means you get a 45% increase in current-carrying capacity with Amerzone-B as compared to the capacity of standard 60°C rated compounds. For network service, Amerzone-B will withstand emergency overload copper temperatures *up to 260°* for short periods without damage. No other rubber insulation has such exceptional resistance to heat, moisture, ozone and cold. You can bend it at —40°F. without cracking. Ozone tests to industry standards show no damage to this dense, nonporous insulation. Amerzone-B insulated cables installed over 12 years ago are just as good today as they were when installed. It's the ideal insulation for 5,000 to 15,000-volt cable. You can use USS Tiger Brand type RR Cable with Amerzone-B insulation anywhere . . . bury it, put it in conduits or ducts, string it overhead.

USS Tiger Brand type RR Cables are also made with other types of rubber insulation, each one compounded to do a special job. For complete information on Amerzone-B insulated cables or any other Tiger Brand Cable, call our nearest Sales Office or write American Steel and Wire, Dept. 1245, Rockefeller Building, Cleveland 13, Ohio.

USS, Tiger Brand and Amerzone-B are registered trademarks

*Conditions: 3 single conductors # 4/0 in 2½" conduit (exposed & enclosed), 40°C ambient air temperature

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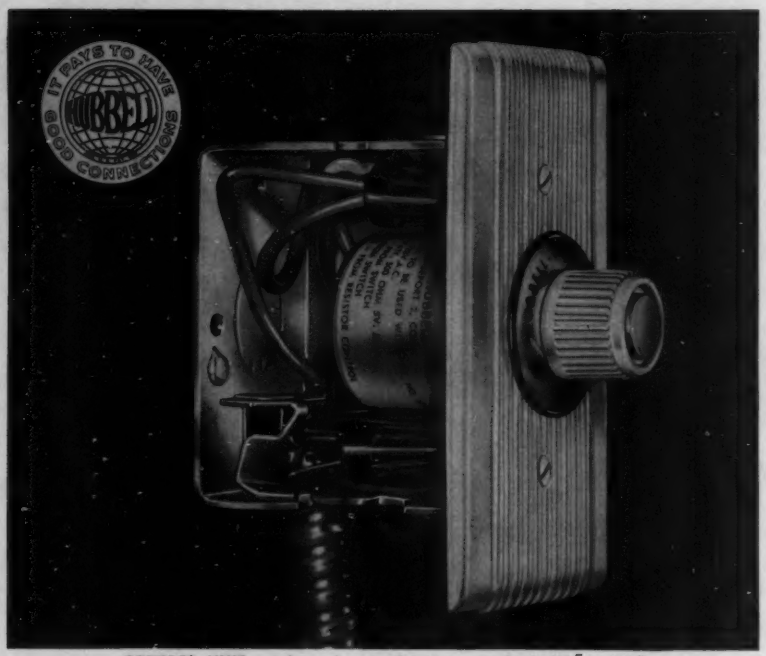

CONTROL UNIT consists of potentiometer, standard 4½" x 2¾" switchplate (brown or ivory), and matching gold-trimmed knob.

FASTER TO INSTALL

"HUBBELL-TROL" DIMMER

FITS STANDARD WALLBOXES

- **No Transformers or Rheostats to Mount in Wall**
- **Dims Incandescent and Fluorescent on Same Circuit**
- **Uses Standard Switchplates, Single or Ganged**

Not a rheostat . . . not an autotransformer . . . the new "Hubbell-trol" Dimmer operates on the saturable reactor principle. It needs no special wall construction for mounting transformers . . . no oversized wallboxes and switchplates.

All you do is wire the compact potentiometer control unit into a standard wallbox taking a standard plate. The aluminum box containing the toroid coil may be surface-mounted anywhere: in cellar, closet, or attic.

One "Hubbell-trol" unit handles up to 600 watts of incandescent alone, fluorescent alone, or incandescent and fluorescent combined. No auxiliary equipment is needed with fluorescent.

Find out more about this truly remarkable manual dimmer. Your Hubbell distributor will demonstrate it for you. Or write now for catalog page and prices.

Toroid Box SR-600-S for remote mounting

Hubbell-trol **DIMMER**

"Hubbell-trol" is a trademark of Harvey Hubbell, Inc.

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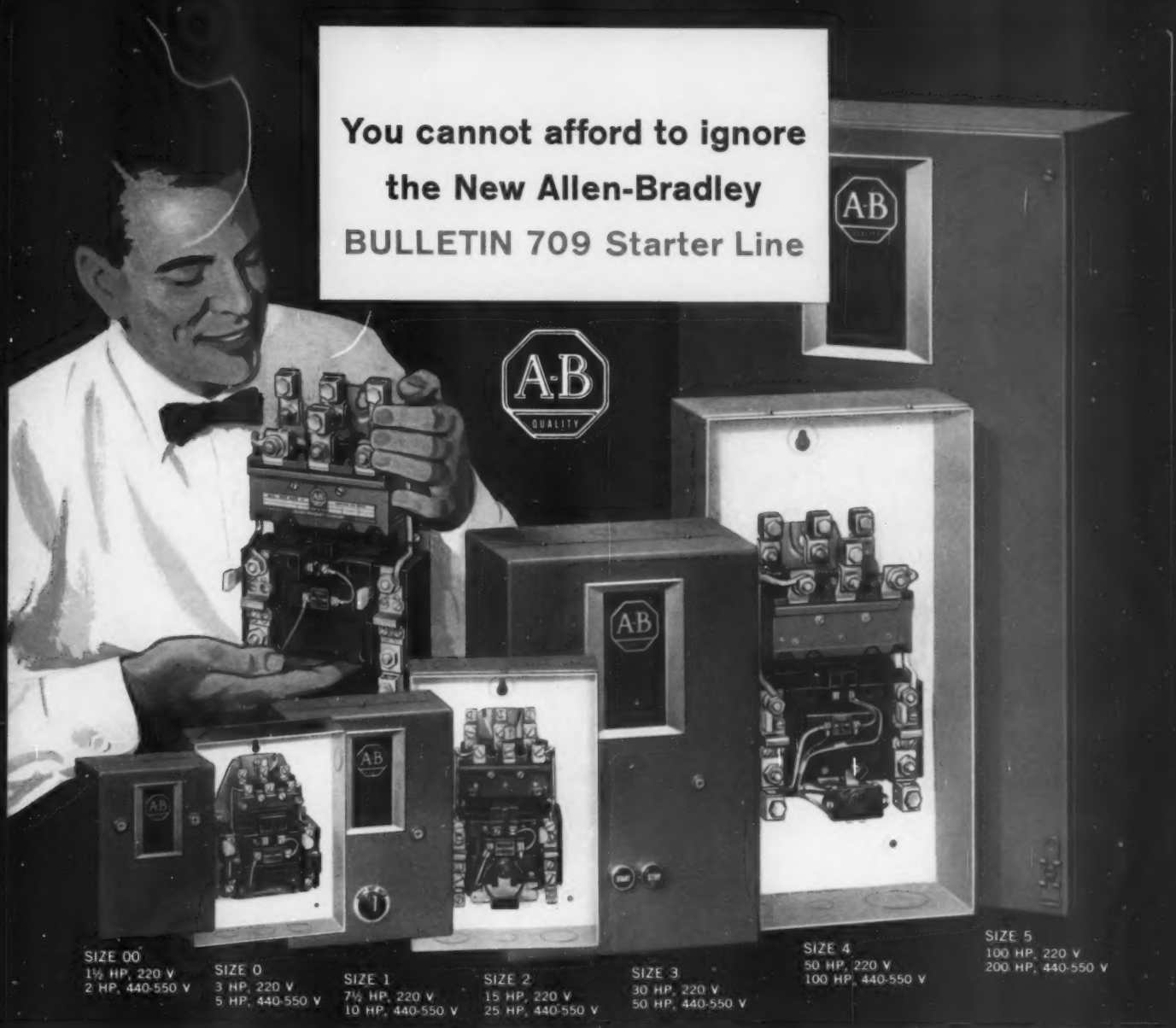


They OUTPERFORM and OUTLAST ALL Others

These new Allen-Bradley starters bring you the greatest advance in reliability and life in all motor control history. Also, they possess a compactness that's almost unbelievable—especially in the higher ratings.

The new Bulletin 709 solenoid starters feature a patented, high-efficiency magnet, which is cushioned to reduce shock and wear. Contacts are of weld-resistant cadmium oxide silver. All coils are "pressure molded" for protection against physical damage and destructive atmospheres. The two or three solderpot overload relays are trip-free and tamperproof. Brooks Stevens, famous industrial designer, has given the new enclosures a styling that adds "eye appeal" to every installation. To get full details, contained in Publication 6100, please write today to: Allen-Bradley Co., 1316 S. Second Street, Milwaukee 4, Wisconsin.

SIZE 00 NOW AVAILABLE

Provides the same long life and reliability as others in the Bulletin 709 family. Rated 1½ HP, 220 V; 2 HP, 440-550 V.

15-61-MR

ALLEN-BRADLEY

Member of NEMA

QUALITY MOTOR CONTROL

Here Your Motor Starter
Dollar Buys

MORE OF THE QUALITIES YOU NEED

BULLETIN 709 SIZE 3
across-the-line solenoid starter in Nema Type 1 enclosure.

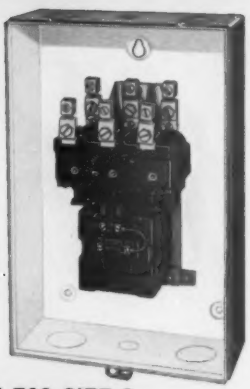
Where else could you possibly obtain—in one complete line—all of the desirable features of the ideal motor control...

1. **Smaller size**
2. **Greater reliability**
3. **Remarkable switching capacity**
4. **Longer life**
5. **Conscientious overload protection**
6. **Simpler installation**
7. **Complete accessibility**
8. **Beautiful appearance—either open or enclosed**
9. **Surprising light weight**

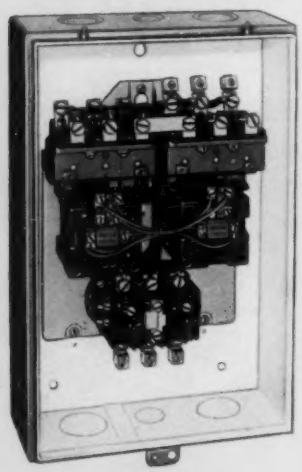
The heart of this new line of magnetic motor starters is the unique solenoid contactor. While it retains the famous A-B one-moving-part principle, it is completely new and far more efficient. This fact is reflected in reduced dimensions for all of these controls. Yet, this contactor design will perform reliably for many more *millions* of trouble free operations.

The new enclosures are very "eye appealing." When the open type starters are assembled into special panels, their neatness and compactness will delight the designers. Full details are in Publication 6100. Please write: Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

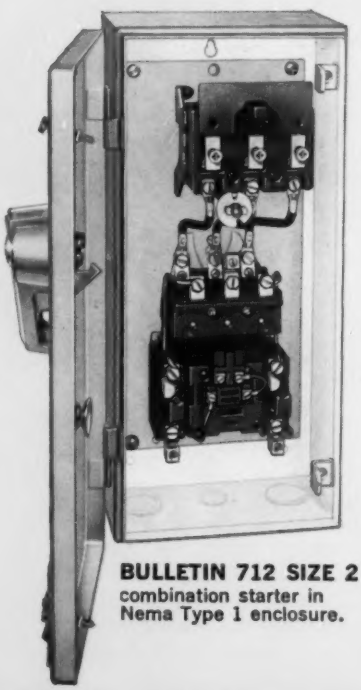
A-B QUALITY



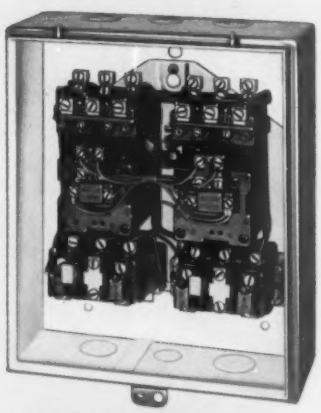
BULLETIN 702 SIZE 3
three-pole, a-c solenoid contactor in Nema Type 1 enclosure.



BULLETIN 705 SIZE 2
across-the-line reversing starter and overload relays in Nema Type 1 enclosure.



BULLETIN 712 SIZE 2
combination starter in Nema Type 1 enclosure.



BULLETIN 715 SIZE 1
across-the-line, two-speed starter—with two overload relays per speed—in Nema Type 1 enclosure.

15-61-MR

ALLEN-BRADLEY

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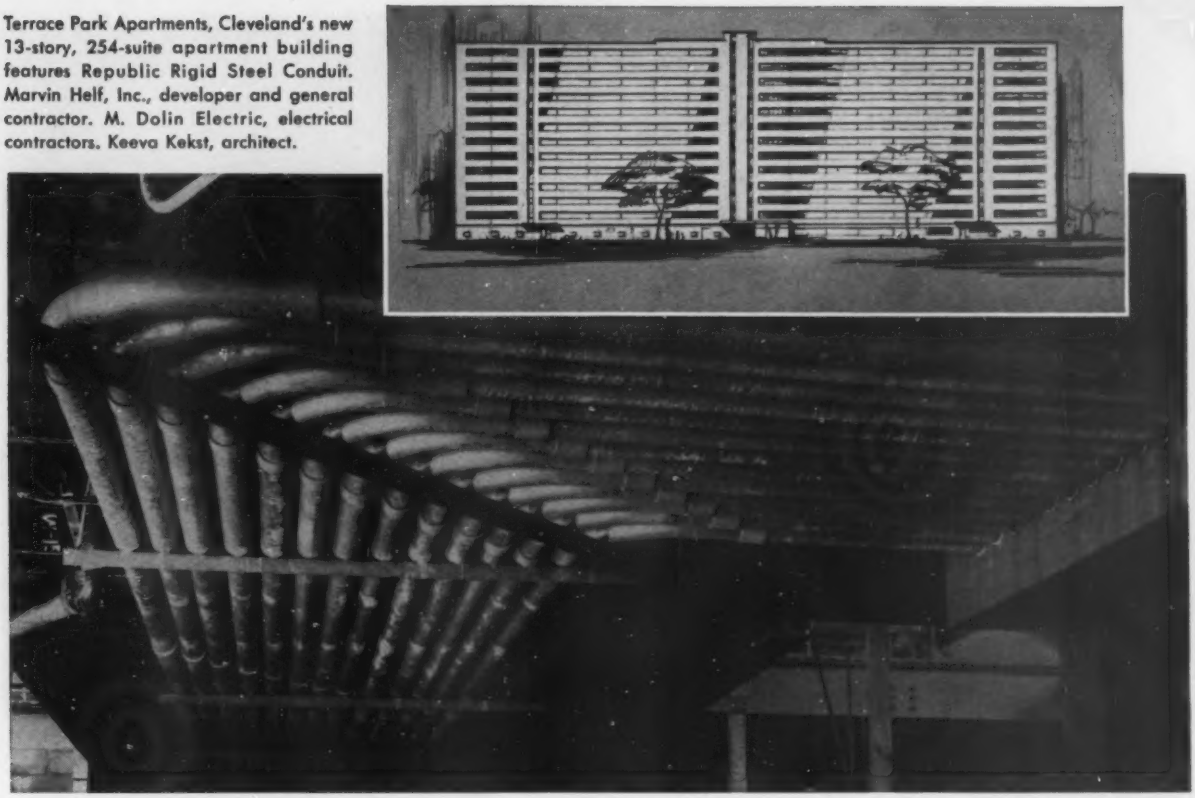
QUALITY MOTOR CONTROL

Terrace Park Apartments, Cleveland's new 13-story, 254-suite apartment building features Republic Rigid Steel Conduit. Marvin Helf, Inc., developer and general contractor. M. Dolin Electric, electrical contractors. Keeva Kekst, architect.



REPUBLIC RIGID STEEL CONDUIT

assures fast installation, long life in Cleveland's largest apartment building

The Terrace Park Apartments, new 13-story, 254-suite apartment on Cleveland's East Side, utilizes Republic Rigid Steel Conduit for heavy duty runs.

Hot dipped, galvanized Republic Rigid is completely protected for long service, with threads and interior as well as exterior surfaces fully coated.

Free-running threads and ductile, even bending steel make Republic Rigid Steel Conduit easier to install, too.

Republic Rigid is produced by Republic's famous continuous weld process to meet the most severe service requirements. Fully tested, inspected, and approved, it carries the seal of Underwriter's Laboratories, Inc.

For more information about the advantages of Republic Rigid Steel Conduit, call your Republic representative or write direct.

Compatibility and strength characterize raceways made of

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STEEL AND TUBES DIVISION

REPUBLIC STEEL

Cleveland 8, Ohio

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION • DEPT. A-2708
227 EAST 131st STREET • CLEVELAND 8, OHIO

Please send me more information about the advantages of Republic Rigid Steel Conduit.

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

For more details on above items, use reply card on page 19

No dark corners or bins obscure vision or impede handling of materials in the R. E. Lee warehouse.

Long-sought good illumination

Offices — even the warehouse — are well lighted

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electrical Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

By R. E. Lee, President, R. E. Lee Electric Co., Inc., Newington, Va.

◆ During the many years we rented buildings to carry on our contracting work, I always said that if I ever owned a building of my own, good illumination would be my top consideration.

Whether it would be in the warehouse or in the general office, employees would not fumble in half darkness to locate an item in a bin, or become excessively fatigued working over figures because lighting caused eyestrain. Good lighting, I am convinced, can remove many of the personnel problems with which the average business is harrassed.

In our new two-floor building, 50 by 100 feet, we have low-voltage, touch plate wiring throughout. We believe we have superior lighting conditions in all work areas, the very best illumination we could design for our employees.

In the 1,500 square foot office area, comprising the president's room, conference room, two estimating rooms, general office, and reception room, fixtures were planned to give the exact lighting each room requires.

There are surface-mounted six-tube fixtures four feet long in the president's office which provide the proper amount of lighting, adjustable to a day's requirements.

On a bright day lighting can be reduced so that only two tubes are in use. On a dark day all six tubes in a fixture located over his desk may be needed.

Regulating the amount of light is an efficient as well as economic measure for the best possible job.

A conference room has four-tube fixtures eight feet long furnishing equally bright illumination throughout the room. A pull-down lamp serves to brighten a telephone stand.

An eight-foot louvered fixture of six tubes in the estimating rooms diffuses light to 130 foot-candles at desk level. In our general office touch plate controls give maximum control to provide the most light needed.

Here we have six four-foot fixtures of six tubes each, and can use every one of them on a dark

Six four-foot fixtures of six tubes each illuminate the general office.

A pull-down lamp over a telephone stand gives supplementary lighting.

Mr. Lee touches a remote control switch which turns on the extra light.

realized by contractor

to insure efficiency and productivity

day, or switch them all off on a clear sunny day when natural light is sufficient.

The warehouse is one area long neglected in good lighting. Yet here good lighting is obviously time- and effort-saving. We have no dark corners, no bins so dim that a stockman has to grope blindly for an item in our 5,000 square feet of warehouse.

We have five rows of continuous 65-foot runs of two-tube, four-foot, fixtures of the egg-crate variety. Mounted on channel iron at seven-foot intervals from a 12-foot ceiling, the fixtures are nine feet off the floor.

Mast control panels at the front and rear entrances of the building permit switching on or turning off the light in any area. They also serve as a reminder when lights may have been left on.

(Continued on page 139)

A louvered eight-foot fixture of six tubes in the firm's estimating room provides diffused light of 130 footcandles at the surfaces of desks.

High-level illumination is integrated

Full utilization is made of lighting fixture heat in winter months to create

This article should be especially helpful to the following readers:

- Electrical Contractors
- Electrical Utilities
- Electrical Wholesalers
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

◆ For its lighting alone, the new general headquarters building of Georgia Power Co., in Atlanta, would have been of special interest to the electrical industry; but as an example, also, of the integration of lighting and air conditioning with full utilization of the lighting equipment heat in winter months, it becomes a particularly timely study.

The electrical design of this unusual installation was prepared by Blakely-Daniels and Associates, consulting electrical engineers of Atlanta. The electrical wiring contract was performed by Bagby Elevator and Electric Co., of Birmingham, Ala., through its Atlanta branch.

The building design was begun previous to the publication in 1958 by the Illuminating Engineering Society of the higher recommended levels of illumination. As originally designed, the lighting level in the building would have averaged 40 footcandles.

With the release of the new, higher recommended levels based on the Blackwell report, the power company management decided to utilize the new footcandle levels throughout the building with the result that the average area level is approximately 100 footcandles. Specific applications in different portions of the building vary from 30 to 200 footcandles.

This considerable increase in footcandle levels upped the air conditioning requirement approximately 24 per cent. Since the heat generated by the lighting equipment was greater than the heat loss of the building at the winter design temperature of ten F, a system was designed to circulate the return air over the lighting equipment so that the heat generated could be utilized in the heating system. In the summer, the air circulated over the fixtures is automatically exhausted or rechilled, depending on the humidity and temperature differences between inside and outside air.

Supplementary heating units of 500 watts each were installed under each window and are actuated by outside thermostats set at 27 F to prevent window sweating. The heated air from these window heaters sweeps up over the windows and into the return air system without heating the room. The heated air is then reused where needed.

In addition, resistance heaters were installed in the hot air duct to supply heat at night and during weekends and holidays when the lighting system is not in use. A total of 87 kw of resistance heating per floor was installed. The lighting load per floor is 90 kw.

The higher illumination levels adopted, 200 footcandles in some instances, necessitated new concepts in luminaire design in order not to exceed brightness limitations. Throughout most of the general office areas two- by four-foot recessed Wakefield "lay-in"

In the office of E. C. Hammond, Georgia Power Company secretary, single-lamp, 40-watt, 277-volt, rapid-start strips are used on approximately 12-inch centers, 12 inches above a gold anodized "T" grid system into which four- by four-foot arched, opal acrylic panels are laid. The filler units are four-foot by six-inch and six- by six-inch perforated metal painted white and coated with clear acrylic plastic to provide an interesting and pleasing relief from the bland monotony which would result otherwise. Maintained illumination is 100 fc.

with office building air conditioning

a comfortable working environment in the new Georgia Power headquarters

The central billing office has two- by four-foot "lay-in" troffers in rows spaced four feet apart to provide a minimum maintained illumination of 150 footcandles.

Luminaires are placed within two feet of walls wherever possible. The luminaires are Wakefield troffers with an anodized aluminum louver for brightness control.

troffers are utilized in various arrangements to provide from 100 to 200 footcandles.

The luminaires are 277-volt, four-lamp, 40-watt rapid-start units using an anodized aluminum louver which provides brightness control.

Floor and wall reflectance values were given special consideration with a view of increasing diffusion and supplying a large component of vertical plane illumination.

Many of the general office areas have continuous troffer patterns in the ceiling, with individual offices outlined by partitions extending upward seven feet, leaving a two-foot space between the top of the partition and the ceiling.

The central billing office, which includes large general office areas for desks, files, card sorting equipment, data processing equipment, etc., utilizes the two- by four-foot troffers previously described in continuous rows on six-foot centers to provide a minimum maintained illumination of 150 footcandles. Wherever possible, the luminaires are placed within two feet of walls.

In the advertising department and some other areas, the two- by four-foot troffers are used in continuous rows on four-foot centers, providing over 150 footcandles of maintained illumination. Again, the luminaires are placed within two feet of walls wherever possible. Some two- by two-foot units are used where necessary to carry out the ceiling lighting pattern.

The same two- by four-foot units are also used in some of the large executive offices. The units are grouped to provide an interesting ceiling design and to provide a minimum maintained illumination of 100 footcandles.

Typical of some of the other executive offices is one utilizing single-lamp, 40-watt, 277-volt rapid-start strip lights on 12-inch centers, installed 12 inches above a gold anodized "T" grid system into which four- by four-foot arched, opal acrylic panels are

laid. Filler units six inches wide, made of perforated metal painted white and coated with clear acrylic plastic, separate the four- by four-foot units and provide an interesting and pleasing relief from the bland monotony which would result from a solid luminous ceiling. The maintained illumination in these offices is 100 footcandles.

Luminous ceilings are used to illuminate the large elevator foyer on each floor. Single-lamp, 40-watt, 277-volt rapid-start light strips on 18-inch centers are installed 12 inches above a suspended "T" grid system in which two- by three-foot panels of anodized aluminum "Honeylite" are supported. The result is 100 footcandles of maintained illumination.

The drafting areas are lighted to 200 footcandles with units similar to those used in other areas of the building except that they are spaced closer together. Reflector type fluorescent lamps are used with the reflector side down in order to reduce the brightness to a minimum and to eliminate sharp shadows from the edges of drawing instruments.

Special system needed

A special system had to be designed to utilize the lamp heat in the heating system and to dispose of the lamp heat during the summer in order to reduce the load on the air conditioning system.

Another factor that entered into the design of this system was the fact that on coldest days both heating and cooling are required at the same time in different sections of a typical floor. The perimeter offices require heat, and the interior offices cooling even on ten F days.

To meet these conditions, the air distribution system was designed with a hot deck and a cold deck system on each floor. Each zone thermostat controls a mixing box taking air from the cold deck at 53 degrees and from the hot deck at 94 degrees.

Thus the supply ducts fed from the mixing box will supply air of whatever temperature the zone thermostat is calling for from 53 degrees to 94 degrees.

The supply ducts are integrated into the ceiling between the recessed troffer lighting units. The return air is taken through a system of grilles all the way around the perimeter (outside walls) and brought up into the space above the ceiling so that it flows over the troffer units and picks up much

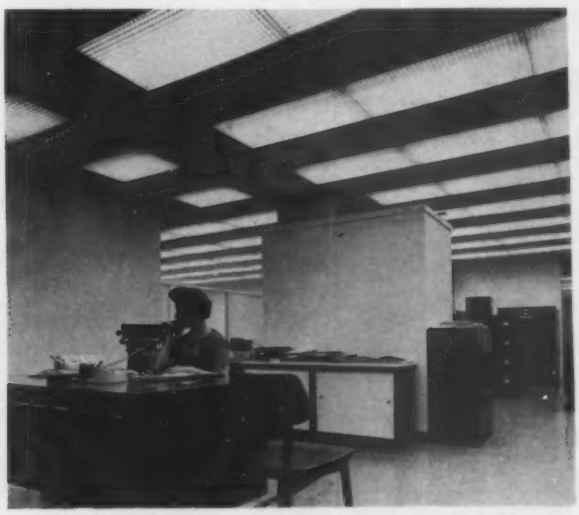
(Continued on page 138)

The elegant reception area on the 21st floor for top executive offices located on the 21st and 22nd floors has low-level dramatic general illumination provided by Gotham pinhole downlights. Supplementing the pinhole lighting are a special ceiling unit over the receptionist's desk and floor lamps in the waiting area. The bright area behind the divided staircase is a large window admitting daylight to the room.

Typical of service areas in the building are the elevator lobby and reception area on the fourth floor. Single-lamp, 40-watt, 277-volt, rapid-start strips are on approximately 18-inch centers, 12 inches above a suspended "T" grid system in which two- by three-foot panels of anodized aluminum "Honeylite" are placed, with 100 fc maintained.

Two- by four-foot "lay-in" troffers are spaced to provide an interesting ceiling design and a minimum maintained illumination of 100 fc in the spacious office of C. M. Wallace, Jr., vice-president in charge of sales.

Individual office areas are defined by partitions extending seven feet up from the floor, leaving a two-foot space between the partitions and the ceiling.



Two- by four-foot and two- by two-foot "lay-in" troffers two feet apart provide over 150 fc of maintained illumination in this area of the advertising department.

Work areas are well-lighted by 96-inch fixtures, which are suspended from the overhead structural ceiling.

Functional lighting makes factory

Illumination for sportswear manufacturing is provided by 800 two-lamp

This article should be especially helpful to the following readers:

Electrical Contractors ✓
Electrical Utilities ✓
Electrical Wholesalers ✓
Electrical Inspectors ✓
Industrial Engineers ✓
Consulting Engineers ✓

By Reuben Guberman, Field Editor, Miami, Fla.

◆ Totally functional lighting makes Hyal Industries of Hollywood, Fla., a showplace.

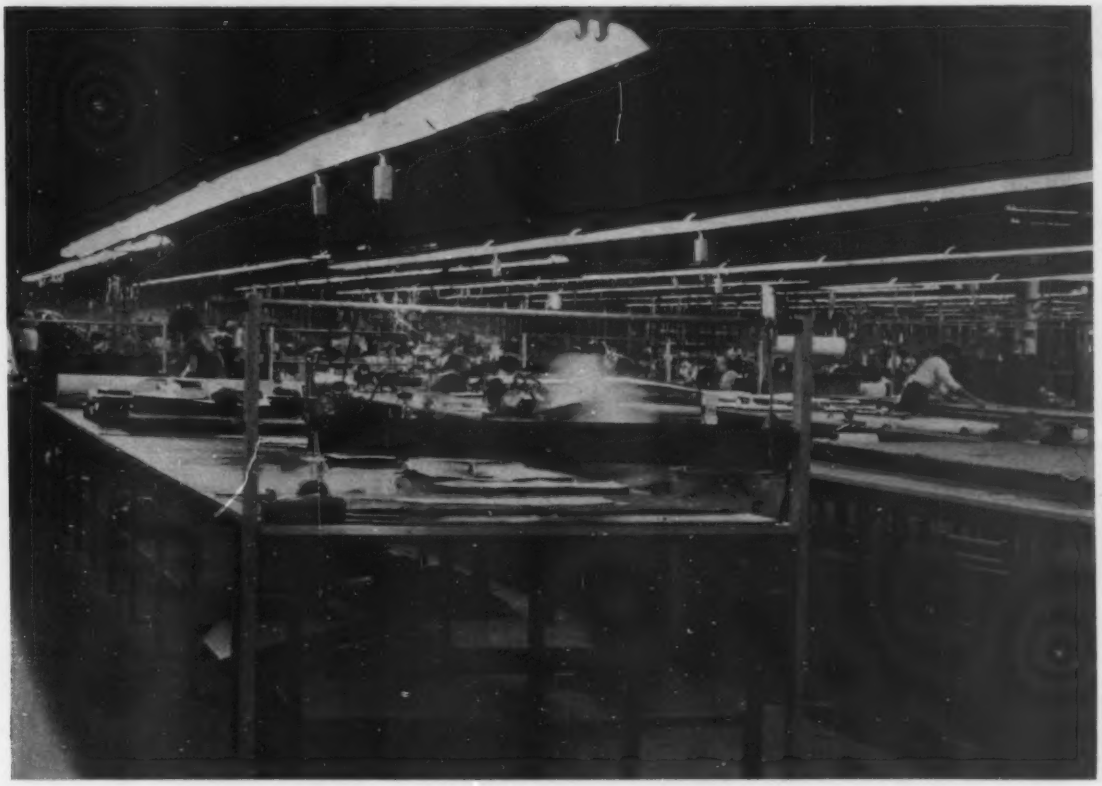
In addition to the basic machinery in use at Hyal Industries, provision had to be made for outlets to handle smaller hand tools and accessories. This manufacturer of ladies' sportswear, in setting up the plant, wanted outlets immediately accessible to each work table, but preferred to get this done without the added expense of special wiring for the purpose.

Donald Garbett, an executive of the U. S. Fluorescent Co., Miami, personally analyzed the problem and, in cooperation with Don Berman, engineer, created a novel fluorescent lighting fixture specially for this application. Installed by Moore Electric of Miami, the fixtures contained raceways built in to carry wiring for the grounded duplex receptacle constructed in each fixture.

To further facilitate the installation of these fixtures, they were built with between-fixture conduit, factory precut and prewired. The factory delivered the assembled fixtures with the outlet raceways also prewired.

Providing approximately 85 footcandles over-all average lighting in the 80,000 square foot plant, the two-light, 96-inch fixtures were hung from ice tong sliding clamps on ⅜-inch rods. Eight hundred fixtures were used to light the entire plant. Buss three-ampere fuses were built into the center of each fixture body for easier preparation and handling. These were custom-made U. S. Fluorescent industrial reflector units.

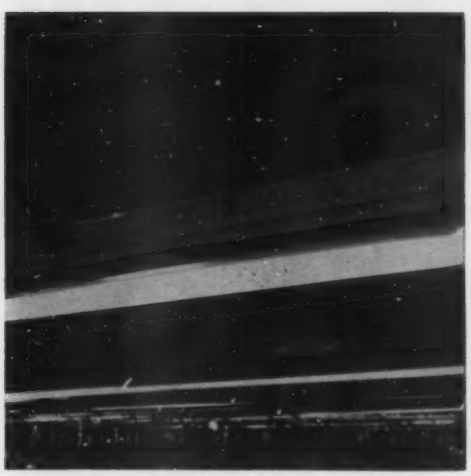
(Continued on page 139)



Raceways in the fixtures bring wiring to the duplex receptacle in each fixture, supplying power for tools.

a showplace

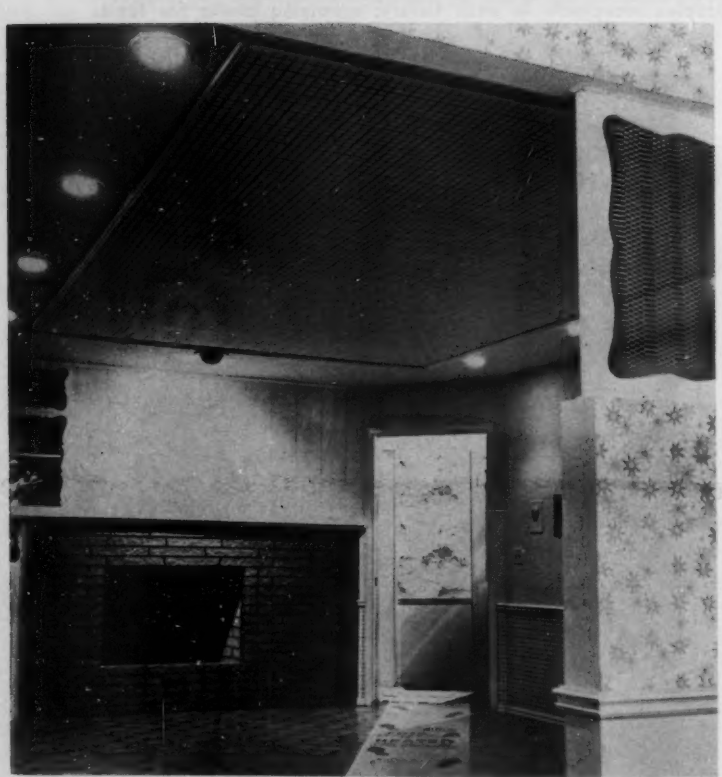
fluorescent fixtures



Sliding clamps on 3/8-inch rods hold fixtures.

Coach lanterns and post lights, with a red brick floor and random wall bricks, give hallway an old fashioned French alley effect.

Highlighting of shrubs behind the patio wall, cylindrical downlights in the overhang, and floods from one side, together with light from the den through sliding glass doors, give ample outdoor lighting.



Four downlights on both sides of a decorative ceiling inset of colorful wallpaper are lighting features of the den. The ceiling fixture near the fireplace is adjustable and will illuminate a painting to be hung. Switches, a dimmer, and the intercom are located near the door.

Well-lighted from every angle, the kitchen has counter illumination, sink and stove hood units, and a recessed ceiling fixture. The dinette has a hanging fixture.

Quality lighting design brings out charm of traditional home

A functional but creative installation of lighting equipment in a new home emphasizes what relighting can do for an older home

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electrical Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

By W. U. McCoy, Field Editor, Oklahoma City, Okla.

◆ There is an understandable tendency to associate outstanding home lighting design with contemporary architecture, since new approaches to architecture not only encourage but demand new solutions to lighting problems.

But a woman home builder with a keen eye for detail has completed an example in Oklahoma City showing that creative lighting design can be used to bring out the full charm of a traditional home.

Bertha Markham of Markham Construction Co., builder of a stately, V-winged, Norman design residence at 3729 N.W. 64th, called in Marguerite Borelli of Oklahoma Gas & Electric Company as a lighting consultant. Mrs. Borelli's lighting design evolved as functionally and as creatively as for any comparable contemporary home. Fixture design and usage stress and enhance the period atmosphere of the $47,500 home.

Yet Boggs Electric Co., contractors, found nothing unknown to the industry, nothing of expensive extravagance in this blending of old and new.

On approaching at night the visitor is first aware of a warm amber wash of color on masonry areas of the home, cool blue tones on gray-stained areas of wood, and discreet highlighting of shrubs. This outside lighting plan gives a dramatic effect when inside lights are off, and is pleasing with inside lights on and drapes drawn; with drapes open, and the house lighted both inside and outside, a festive effect is achieved in the blend.

The home, on a corner lot, is lighted on the side street by one low umbrella lamp; two toadstool stickdowns; a 15-watt frost-blue fluorescent, stickdown adjustable

Outside gray-stained wood areas (far right) are washed with blue light, the masonry areas with warm amber.

In the dining area bare fluorescents in the cornice brighten the filmy green drapes. A china chandelier hangs centered over the table area.

A six-foot, four-inch strip of rose-tinted rubbed glass used with the fluorescent fixture in a bathroom accents the theme of the wallpaper.

Warmth is brought to the foyer by a hanging fixture. Through the door may be seen one of the downlights emphasizing bay window contours.

for the wood area; and three 150-watt floods with amber reflectors for masonry areas.

Three toadstools are placed at the area left of the entrance, and a traditional post lamp, using a 100-watt light in a frosted chimney in smoked brass, is placed low on a masonry support near the entrance.

The front of the house to the right of the entrance is modeled by three more toadstools, a frost-blue fluorescent for the wood area, and an amber light on the masonry to the extreme right.

An amber flood is also placed low behind a pillar at the entrance, blending with a recessed light overhead near the door.

A glass and brass fixture hanging in the foyer sets the tone, casting a soft shadow-pattern on a light ceiling. To the left, in the formal living area, a small bay gives full light in the daytime.

At night, three 100-watt reflector pen lights over the drapes keep the light interest in the same place. Plug-in lamps complete the simple lighting in this room. Window interest is kept strong in the dining room also.

A long full window of leaded glass accents the Normandy effect. Movable wood interior shutters may be drawn over the lower part of the window, above eye level, and filmy drapes drawn. Three bare tubes of 40-watt fluorescents are used in the cornice above the window. The dining table is centered under a decorative chandelier, a gold-trimmed painted china fixture with 40-watt bulbs in an antique air.

Proceeding to the kitchen, the visitor notes an 18-inch ceiling fixture lamped with two 150-watt bulbs, two 15-watt fluorescents as counter lighting, two recessed 75-watt bulbs as sink lighting, and two open 60-watt incandescents in the stove hood. In front of the kitchen bay window, a hanging birdcage fixture uses one 100-watt bulb in a cylinder as a downlight over the dinette.

Strong basic lighting is used with patrician restraint through most of the house. The lighting is engineered to be highly functional, yet it is such an integral part of the decor that no jarring note of novelty clashes with the quiet good taste and subtle blending of colors found.

In the large informal den, however, the informality is accented by a dramatic design. A bank of four 75-watt downlights is used 18 inches from the wall on each side of a long rectangle of colorful wallpaper, bordered by a wood strip and set in the ceiling like a large mural. The eight downlights are controlled by a dimmer switch, turning candlelight low or party bright.

One other ceiling light, a 150-watt reflector adjustable to any angle, is placed 24 inches from the wall over the mantle, for displaying a painting. If the light had been installed to model fireplace masonry, it would have been placed closer to the fireplace.

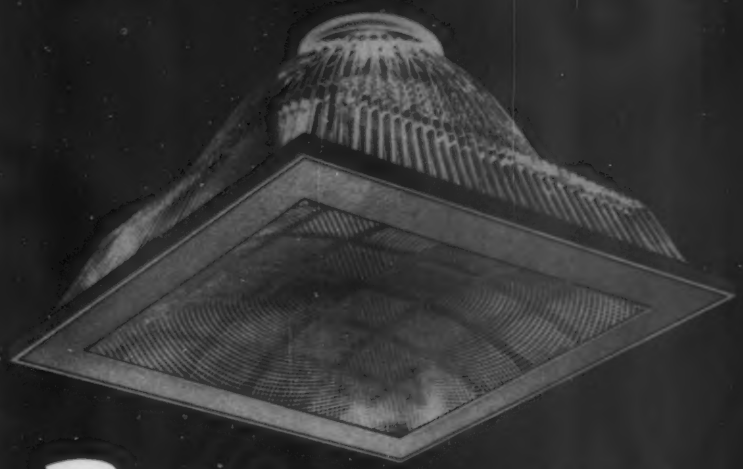
But in the den, as in the rest of the home, lighting is planned to tie in with or complement some other feature—the bank of downlights with the rectangle of wallpaper, the cove lighting in the dining room with the rich Normandy window, the antique fragility of the chandelier with formal dining, and the downlights in the living area with the contours of the bay window.

And always, complete harmony of setting is achieved; in the dining area, soft pastels, filmy green drapes, a gold-lined painted china chandelier; in the utilitarian air

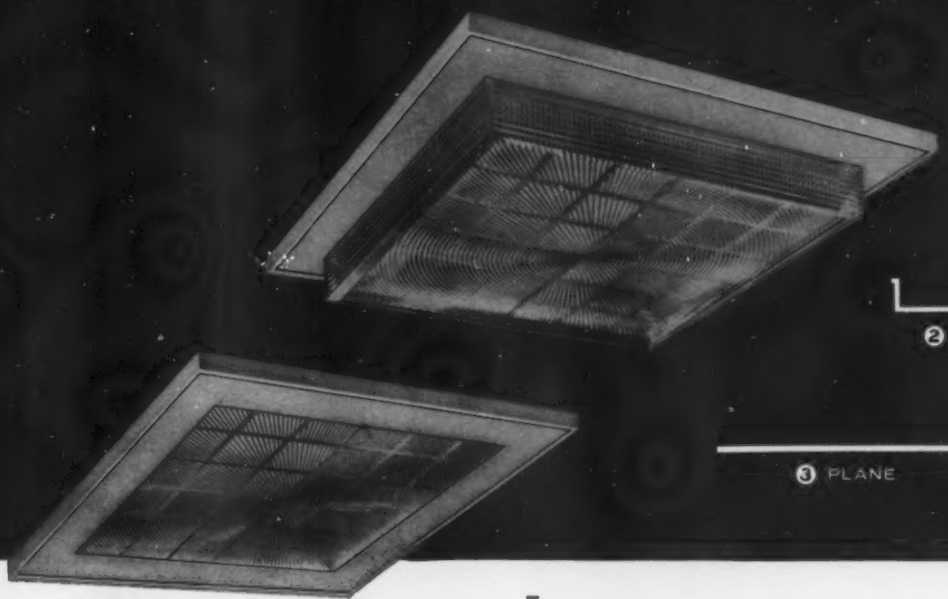
(Continued on page 138)

OPTICAL TRAIN

. . . In PAL Luminaires the prismatic glass reflector is precisely designed to coordinate with the Controlens (any one of three *interchangeable* contours). Prismatic control assures total luminosity, complete absence of glare.



Your Choice of 3 CONTROLENS® in Holophane *PAL® Luminaires



1 CONCAVE

2 DROPPED TRIM

3 PLANE

*Positive Automatic Latching

PAL Installation in MACY's, (N.Y. Dept. Store)

Positive Automatic Latching Works Simply

Flexibility for Versatility

Designer's Choice . . . Three prismatic lenses with different contours — "concave", "dropped trim" and "plane"—permit an unusually broad scope of design expression. Luminaires can be applied as individual tile-fitting units or as matched combinations, 2 in line or 4 square.

Engineer's Preference... The optical train consistently produces the highest lighting performance, directing maximum illumination where it is most required. Wide range of possible lighting levels—choice of 150, 200 or 300 Watt lamps.

Budget-Maker's Selection... Positive Automatic Latching works simply for quick, low cost relamping and servicing—push against lens to open, push against trim to close.... Glass components are easy to clean, eliminate deterioration. PAL Luminaires are economical to install and maintain.

Write for engineering data.

HOLOPHANE COMPANY, INC.

Lighting Authorities Since 1898

342 Madison Ave., New York 17, N. Y.

THE HOLOPHANE CO., LTD., 418 KIPLING AVE. SO., TORONTO 18, ONT.

'Room of Tomorrow' gives emphasis

Designer uses a variety of fixtures to show some of the latest ideas

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electrical Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors ✓
- Industrial Engineers
- Consulting Engineers ✓

◆ The "Room of Tomorrow" displays sponsored each year by the National Hotel Exposition have gained acceptance as an important indicator of trends in design.

Designer Emily Malino, responsible for the rooms to be shown at the 1961 exposition—which opens in the New York Coliseum on November 5, has operated on the theory that a hotel or motel room is a home away from home. She has developed designs that include ideas which can be used effectively by home lighting designers. Her lighting design indicates an imaginative flair for decorative values as well as functional performance.

Her talents are demonstrated by a one-room or studio suite (illustrated here), and a deluxe two-room suite.

Meticulous attention has been paid in placing the lights to establish the right "lighting mood" for the right area, particularly to provide comfortable visibility for all seeing tasks.

In the one-room suite, several interesting lighting innovations have been introduced. Positioned against the length of one entire wall, five poles have been recessed between panels that are set out from the wall, just enough to conceal the thickness of the poles, but nevertheless giving a dramatic modular effect.

Thus, each pole illuminates a given area, and is equipped with the proper lighting unit for that application: two of the poles are near the beds, permitting each occupant to read in comfort. Another is stationed near a desk, providing working light, while the others are placed near the vanity for make-up light.

On the ceiling in the L-shaped area in this one-room suite, six fixtures, with striking walnut and birch frames, are mounted in an L-pattern, in themselves helpful invitations to move with ease through the space.

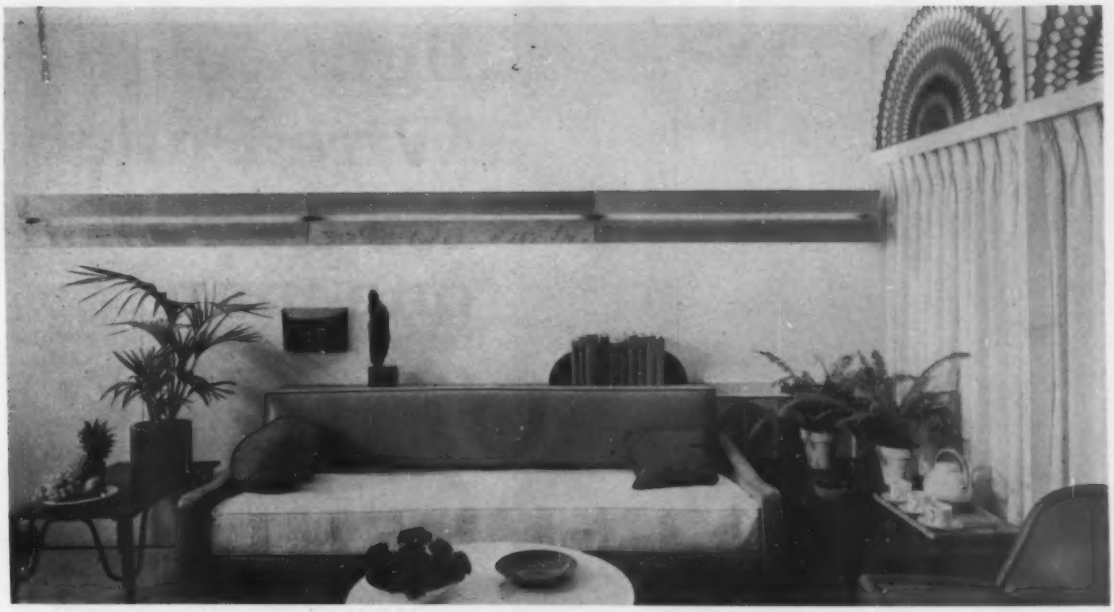
The entryway in the two-room suite sets the theme by the use of a recessed domed fixture which gives the effect of a skylight, thus inducing a sense of openness and spaciousness.

In the living-dining room there is an unusual handsome pendant fixture. The light source is totally concealed within the six long tubes, but at the end of each tube is a sphere constructed out of heavy Venetian glass. In each sphere countless numbers of air bubbles are trapped in the glass, thus the light shines through the glass and sparkles like an illuminated fountain at night.

(Continued on page 138)

to important lighting design trends

in hotel-motel room lighting—ideas applicable to residential installations



Above: Three units are mounted over the couch, giving the effect of custom-built installation without the high cost of custom-built lighting. Twin solid red birch baffles shield the two fluorescent tubes, wash the wall up and down with light.

Right: Moving in several planes, the pantograph wall lamp provides good light with its molded styrene shade. In addition to abundant glareless light downward, it provides a halo of light upward to prevent the annoying contrast of dark and light that is often produced by reading lamps.

Left: Reflection of the walnut-framed ceiling fixtures seems to visually enlarge the room, encouraging movement throughout the area. Pleated glass chimneys are used on the lamps flanking the mirror, and bullets are used on the lamps flanking the walnut panel in the living room area. All four of these lamps may be moved up or down the poles on which they are mounted. A versatile, long-armed reading lamp provides light for anyone on the couch. Two recessed ceiling fixtures also provide light for the living room.

JOB-PROFIT TOOLING IDEAS

FROM GREENLEE

New lightweight Wire Puller for fast one-man operation

- **WEIGHS ONLY 29 LB**
- **TWO-SPEED WINCH . . . 3 TO 1 AND 9 TO 1 RATIOS . . .**
- **PATENTED RATCHET ACTION**

Easily carried and operated by one man, the new GREENLEE No. 766 Wire Puller requires only 30-lb handle pressure to pull 1500 lb. Wire can be pulled at any angle from large or small outlet boxes or from the end of exposed conduit. At all times the pull is in line with the conduit . . . no strain on the hanger or outlet box. No loose cable to contend with . . . reel holds 200 feet of aircraft steel cable. Patented winch ratchet action . . . open-side pulley support for easy access to any outlet box. Typical performance: Large Midwest contractor reports pulling four strands of 4/0 wire through 165 feet of 2½-inch conduit with two 90° bends. Time, *20 minutes.*

For large-size cable pulling use Greenlee No. 765 Cable Puller

ONE-MAN OPERATION • 7500 LB PULL • TWO OPERATING SPEEDS
Portable . . . easy to set up and operate. Use it on exposed or concealed conduit. Pull is in line with the conduit with no strain on the hangers or outlet boxes. Can be equipped with flexible elbow attachment for pulling from concealed conduit . . . permits placing puller at any desired distance from end of conduit.

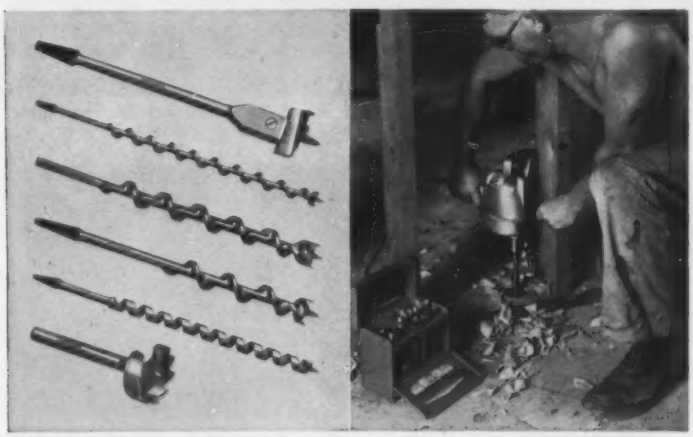
Hand and power drivers for knockout punches

Greenlee No. 7646-A hydraulic knockout punch driver develops 11 tons' ram force to easily drive punches through 10-gauge metal . . . cuts ½" thru 5" conduit openings in seconds. Many times faster than wrench method . . . can be used in cramped quarters. Timesavings quickly pay for this efficient tool. Designed to drive all Greenlee knockout punches. It is available singly for punches already owned or is available in sets with 6 or 10 punches.

Greenlee one-shot knockout punch drivers are fast, lightweight, and powerful . . . easily operated by one man. Require no pre-drilling or step-up punching to make conduit openings . . . high-strength aluminum "C" frame. Punch cuts through 10-gauge steel with ease. Two sizes: No. 1731 to punch holes for ½", ¾", 1" conduit and No. 1732 to punch holes for ½" thru 4" conduit. Hand or power pump operated.

Greenlee ratchet knockout punch driver makes conduit openings 6 to 8 times faster than with wrench method. Easily operated in any position. Use with standard Greenlee knockout punches from ½" thru 3". Available singly or with set of punches for ½" thru 2" conduit.

Greenlee makes a complete range of knockout punches for 1/2" thru 5" conduit . . . fast, easy cutting through 10-gauge metal . . . clean, accurate holes.

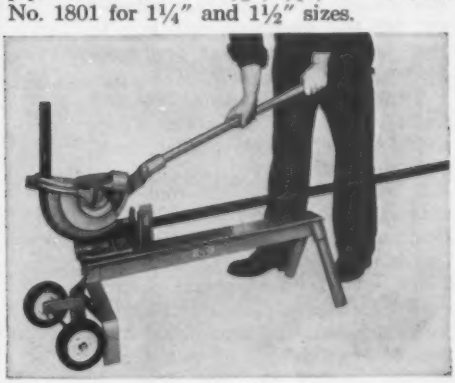


Fast-boring Greenlee bits for electrical work

Jobs go smoother when you standardize on Greenlee precision-made boring tools. Power drill and hand brace types . . . various styles and lengths for all types of electrical work. Electricians' auger bits, bellhangers' drills, solid-center auger bits, expansive bits, ship augers, pipe bits, spade-type power bits. Highest quality for fast, accurate boring and long life under hard usage.

Hand ratchet benders

Fast, easy way to make bends up to 90° in ½" thru 1½" rigid conduit. Greenlee ratchet bender is self-contained and easily portable. Ratchet action for short, powerful strokes . . . easy-to-reach ratchet release . . . built-in 0° to 90° bending gauge . . . swing-away pipe clamp for easy removal of 90° bend . . . direct handle operation for quick bending of small pipe. No. 1800 for ½", ¾", 1" conduit. No. 1801 for 1¼" and 1½" sizes.



WRITE FOR CONDENSED CATALOG E-240A. GREENLEE TOOL CO., 1954 COLUMBIA AVE., ROCKFORD, ILLINOIS

TOOLS FOR CRAFTSMEN

GREENLEE

JOB-PROFIT TOOLING

. . . cost control for contractors

Lighting visually enlarges apartment

With effective illumination a small one-room dwelling looks spacious

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electrical Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

By Maurice Medcalfe, Architect, New York, N. Y.

◆ My plan was to create the visual effect of greater space when I redecorated my New York City one-room apartment (let's face it, it's still "one room" in spite of the realtor's garnished publicity).

First, spacewise, I felt the living room fell into the dining area and vestibule, because of the proportion of wall openings to these areas. A soroban beaded screen to the dining area physically cut off this area, yet allowed a borrowed view.

For the vestibule area, I removed an existing living room closet door, and from a new ceiling track installed two floor-to-ceiling movable panels, which allow closet entry and can almost cut off the vestibule opening. In this fashion, the areas are more defined.

The furniture items are few, and their colors and the room colors cover white, beiges, bronze, reds, and charcoal.

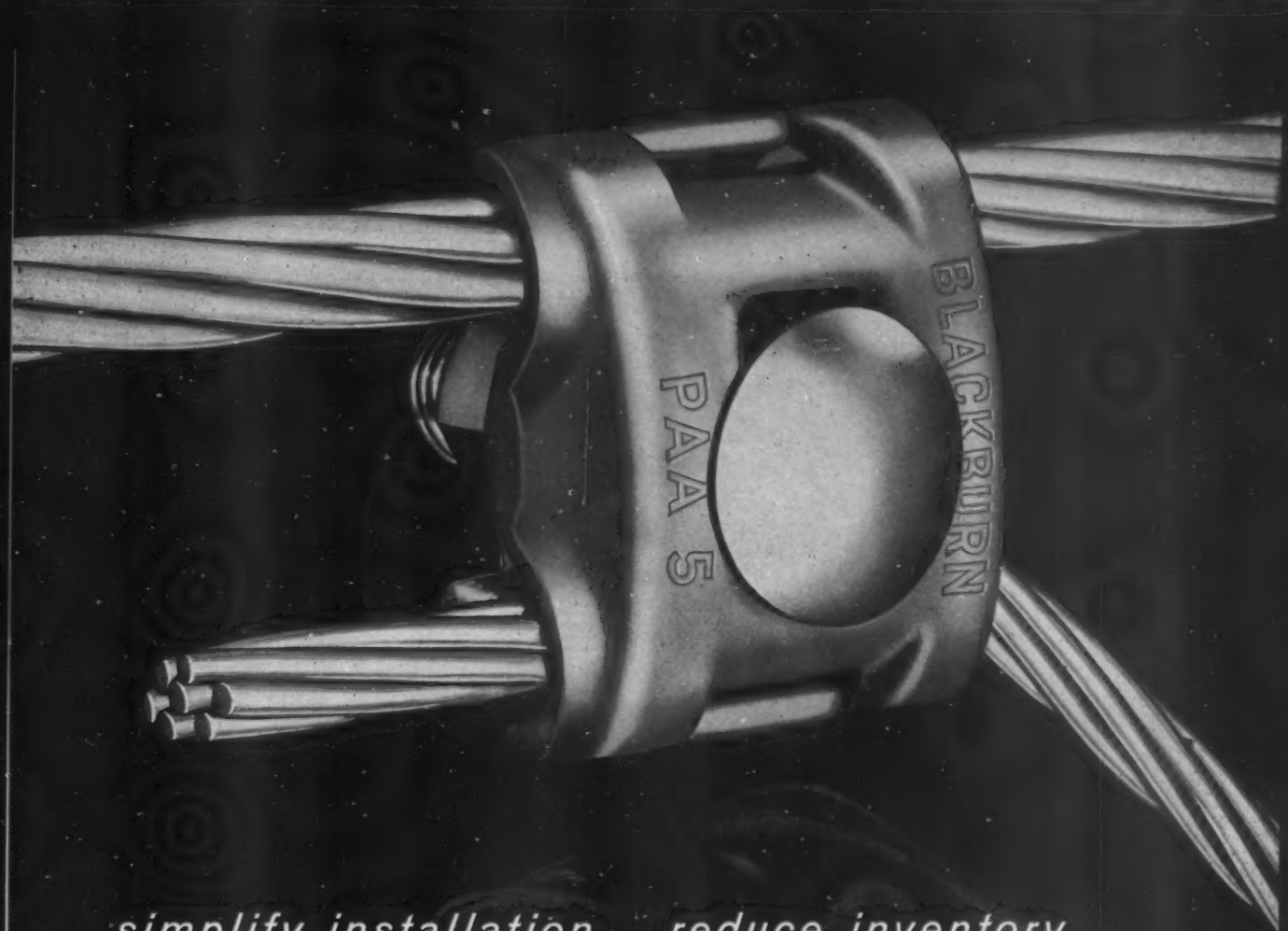
I installed four eight-foot horizontally mounted light spans on three walls of the living room, individually dimmer controlled. These would give general peripheral lighting or accent where or when needed. The down spot over the coffee table is dimmer controlled, as are two other lamps in the living room.

The vestibule has a four-foot light span, ceiling suspended and controlled by a high-low switch. The bathroom wall dimmer controls a theatrical type arrange-

(Continued on page 136)

Lights focused on the beaded screen have variable intensity so that the planting area can be excluded from or included in the view.

Fixtures arranged along horizontal light spans on three walls of the living room give peripheral or accent lighting for paintings, etc.



simplify installation . . . reduce inventory

with BLACKBURN PARALLEL GROOVE CLAMPS

TWO sizes make up to 90% of the tap connections required on most distribution systems.

Tools normally carried by linemen are all you need to install Blackburn parallel groove clamps easily and properly. The problem of finding the right die inserts for specific connections is eliminated . . . the chance of human error is lessened.

Inventories can be reduced drastically. Only TWO clamp sizes take wire sizes from 8 solid to 336.4 ACSR, with taps from 8 solid to 1/0 ACSR.

Use these clamps on **aluminum** . . . also on **aluminum to copper** when prefilled with Contax, an oxide-inhibiting paste non-injurious to natural rubber. This also simplifies stocking, reduces the types of clamps needed in warehouses and on line trucks.

For the few installations outside 8 solid—336.4 ACSR main and 8 solid—1/0 ACSR tap range, other sizes are available.

Blackburn parallel groove clamps are engineered for high resistance to weathering, galvanic corrosion, vibration and other enemies of good connections. Construction is of high-strength aluminum alloy, with rocker and spring action to counteract differences in coefficient of expansion when used for bi-metallic connections.

For complete information and test data, send for Bulletin #6007. Samples on request.

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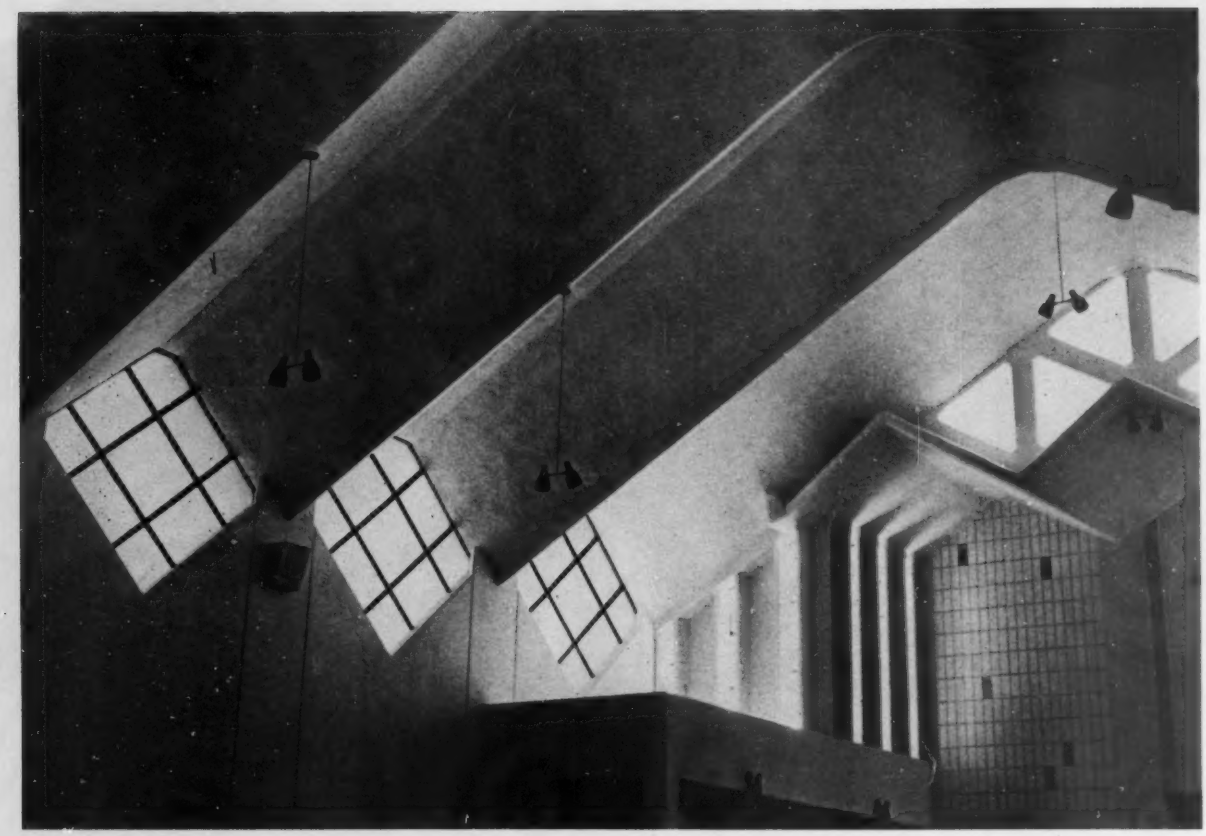
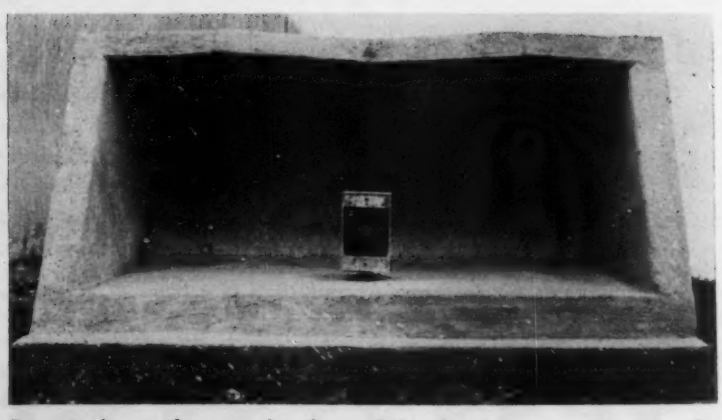


A precision job was imperative in laying conduit because the location of fixtures could not vary from specifications.

Lighting for unique church involved

Poured concrete design of structure required



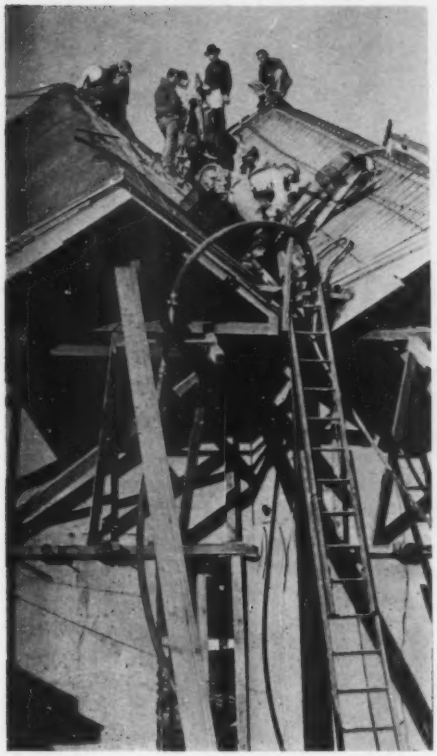
Receptacles on the ground in front of the church were cast to echo the building design. Floods placed in these will illuminate the facade.

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electrical Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors ✓
- Industrial Engineers
- Consulting Engineers ✓

By M. D. Calvert, Estimator, Jay's Electric Service & Supply Co., Oklahoma City, Okla.

◆ When the Christian Church in The Village, Oklahoma City suburb, called on architect Jack L. Scott to design a new sanctuary,



Setting boxes in the roof was a critical operation. Boxes set in the plate valleys were installed with the pour cured on one side before the second pour was started.

Conduit was run to a single light atop the tower where a weatherproof receptacle was placed. Rigid conduit was used in the concrete walls.

unusual wiring problems

exacting work and some ingenious techniques by the electrical contractor

the architect was presented with an unusual problem and opportunity.

He solved it in a path-blazing manner, and Jay Electric Company was called on for some wiring solutions.

Mr. Scott's clients were in favor of the economy of poured concrete, and they had an appreciation for developments in modern building. But at the same time the congregation had an aversion to the dome type of approach. They wanted a building that "looked like a church."

He came up with a clear-span, all-poured concrete structure in a gable design, with high peak folded plates rising 30 degrees.

Mr. Scott poured the folded plate in place, in series, by a method of moving one set of pouring forms and supports. The folded plates then served as a rigid shell roof, supported only at the sides in the 100-foot long building with a roof 57 feet wide.

This is believed to be the first use of poured-in-place folded plates in a gabled, clear-span roof.

Wiring difficulties were enhanced by the roof shape—a series of huge V-shapes looking from side to side of the church, and a series of short V-shapes looking from front to back of the church.

Because of the bend problems we decided not to try to feed across the gabled peak of the roof, nor from front to back across the series of V-plates. We had to come up in each side of the poured wall columns with conduits, then up the valleys of the V-plates to the points in the ceiling from which lights were to hang.

The problem was further complicated by the method of pouring the plates in series. One set of plates was poured and left to cure, with connecting steel rods protruding for tie-in. We had to set the boxes half in one pour and half in another. Sometimes the edge of the fold would be a little higher than the previous pour edge.

(Continued on page 134)

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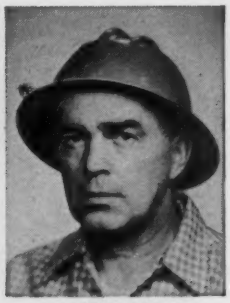

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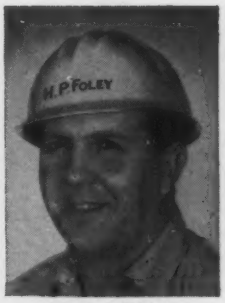

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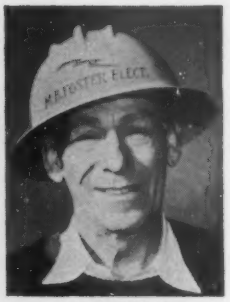

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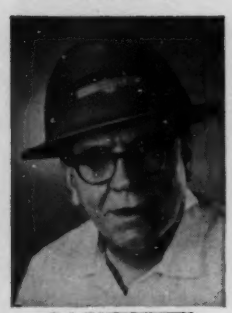

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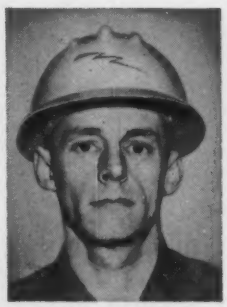

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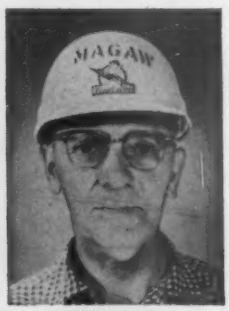

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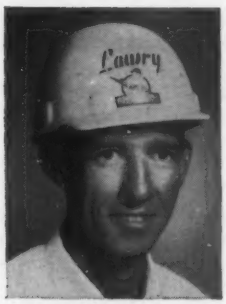

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Application of Code requirements

Wiring and equipment in commercial garages must be safeguarded against contact with flammable gases or vapors from vehicles

This article should be especially helpful to the following readers:

- Electrical Contractors
- Electrical Utilities
- Electrical Wholesalers
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

By Walter R. Stone, Contributing Editor on Code Rules, Utica, N. Y.

◆ Article 510 of the Code headed "Hazardous Locations—Specific" is prefatory to Articles 511 through 517.

The purpose of the latter group of articles is to aid inspection authorities and contractors in determining the classification and boundaries of hazardous areas because of the presence of hazardous concentrations of gases or vapors, or because of accumulations of combustible deposits, such as coatings of paint.

Section 510-2 of Article 510 states, "...Where unusual conditions exist in a specific occupancy, the Code enforcing authority shall judge with respect to the application of specific rules."

It is on this provision of the Code which many inspectors have based decisions which they believed to be necessary for safety but for which they could not find a more specific Code rule on which to base such decisions.

For example, inspectors have ruled that joints, splices, arcing devices, or open wiring could not be installed immediately under and adjacent to gasoline tank vent pipe openings in gasoline dispensing stations.

They have ruled that the area with a five-foot radius up to 18 inches above such vents is a Class I, Division 2 location. As another example, some inspectors have stated that flat rooftops should be classified as Class I, Division 2 within a radius of 20 feet of such vents where the vents are terminated not more than 18 inches above such roofs.

Some inspectors think in such cases that the entire rooftop should be included in this category where there is a parapet wall around such roofs which would, in effect, provide a large pit for vapor accumulations. Such local decisions by inspectors usually are based on this Code permissive or Code-sanctioned authority to "judge with respect to the application of specific rules."

Article 511

Article 511 governs the installation of wiring and equipment in commercial garages. A commercial garage is defined by Section 511-1 as a location where self-propelled vehicles of the type which use flammable liquid or flammable gas fuel are repaired or serviced or a location where more than three of such vehicles are stored.

In other words, if four cars, say, or if one motorboat, one tractor, and two cars are stored in a garage, it is a commercial garage. If only a total of three vehicles are stored, it is not a commercial garage but a residential storage garage.

However, if only one such vehicle is repaired or serviced in such a garage, or in any garage, (by this is meant where one vehicle at a time is normally repaired or serviced) it is a commercial garage as defined by the Code whether the vehicle which is repaired or serviced is a truck, a motorbike, or a self-propelled gasoline-powered lawn mower, or whether a different type of vehicle is repaired each day.

(Presumably, an area where repairs or service is performed on a gasoline-powered lawn mower which is not self-propelled but which has to be pushed is not considered a commercial garage even though its fuel probably is just as volatile as the fuel of a self-propelled mower.)

Fortunately, most electrical wiring and equipment is installed above the 18-inch level even in residential storage garages. Basically, the intent of the rule is to classify areas as commercial garages where servicing or repairing is normally done to gasoline-driven vehicles and to areas where more than three vehicles are stored, such as a four-car garage.

A fine print note refers to NFPA Pamphlet No. 88 for those who are interested in more detailed information concerning garage classifications.

According to the provisions of Section 511-2 the following areas in commercial garages are to be classified as Class I, Division 2 areas:

(1) The entire area up to a level of 18 inches above the floor for each floor at or above grade.

(2) The entire area up to a level of 18 inches above the bottom of outside doors or other openings for each floor below grade.

(3) Where positive-pressure ventilation is provided in an amount adequate to prevent hazardous accumulations of volatile gases above such levels, the entire area up to a level of 18 inches above the floor for each floor below grade.

(4) Any pit or depression below floor level up to 18 inches above the floor level. (Any such pit or depression, when unventilated, may be classified as a Class I, Division 1 area from the bottom of the pit up to the floor level by the inspection authority having jurisdiction.)

Adjacent areas

Adjacent areas where hazardous vapors are not likely to exist, such as stockrooms and offices, are not to be classified as hazardous areas provided that such areas are

either elevated at least 18 inches above the level of the hazardous areas, or are separated from hazardous areas by tight curbs not less than 18 inches in height.

Without such floor elevations or elevated curbs, such areas are to be classified as Class I, Division 2 locations up to a level 18 inches above the floor or, for below-grade floors, to the same level as that set for the adjacent garage floors.

This is because gasoline vapors which are heavier than air will travel in unobstructed horizontal directions even though they are not likely to rise any higher vertically than 18 inches above the floor level.

All wiring and equipment within the hazardous area is required by Section 511-3 to be of the explosion-proof type, generally speaking, or in vaults in conformity with the provisions of Article 501 as discussed in April and May.

Seals required

Section 511-4 requires seals to be provided in all hazardous areas in accordance with the provisions of Section 501-5 as discussed in this department in April.

Briefly, seals are required in each conduit run entering or leaving the hazardous area, in both horizontal and vertical boundaries; entering or leaving an arcing device; and, in the case of two-inch or larger conduit, in each run entering or leaving an enclosure or fitting housing terminals, splices, or taps.

The last sentence of Section 511-4 states, "Raceways embedded in a masonry floor or buried beneath a floor shall be considered to be within the hazardous area above the floor if any connections or extensions lead into or through such areas." This means that any conduit which extends up into the hazardous area must be provided with seals. See Figure 1.

When conduits run below grade within 20 feet horizontally of any gasoline pumps, islands, fill pipes, or vents, they are classified by Section 514-2(b) as being in a Class I, Division 1 area and therefore seals are required where the conduit emerges from the surface even though it originates and terminates outside of the Class I area. See Figure 2.

In this case, if the conduit emerges within the hazardous area, a seal is required 18 inches above the grade instead of at the grade as when emerging outside of the area. See Figure 3.

Section 511-5 governs wiring which is installed in commercial garages above the hazardous area. This includes all areas above the vertical boundaries of the hazardous areas over garage floors and over all areas adjoining the garage which are not suitably cut off by elevation or by elevated curbs as described above. These wiring requirements are as follows:

All fixed wiring is required to be in metallic raceways or type MI cable. Cellular metal floor raceways are permitted to serve ceiling outlets or extensions to the area below the floor in multiple-story garages, but they are not permitted to serve outlets above the floor in which they are embedded which would be within the hazardous area. Section 356-2 also permits cellular metal floor raceways to be used in commercial garages in this restricted manner.

Underfloor raceways, it should be noticed, as distinct from cellular metal floor raceways, are not mentioned as permissible for commercial garages either in Section 511-5 or in Section 354-2.

Cellular concrete floor raceways,

Code test questions

1. By the term *commercial garage* is included a location where one gasoline-propelled vehicle at a time is repaired as a normal procedure. True or false?

2. In a commercial garage, each floor at or above grade is considered a Class I, Division 2 location up to a level four feet above the floor. True or false?

3. In a commercial garage, each floor below grade is considered a Class I, Division 2 area up to a level 18 inches above the bottom of outside doors or other openings which are at or above grade level. True or false?

4. In a commercial garage, any pit below floor level is considered to be a Class I, Division 1 location unless judged otherwise by the Code enforcing authority. True or false?

5. In a commercial garage, raceways buried beneath the floor in a hazardous area are considered to be within the hazardous area even though there are no extensions up into the hazardous area above the floor. True or false?

6. In a commercial garage, all fixed wiring above the hazardous area:

(a) is required to be threaded rigid conduit or type MI cable.

(b) is required to be metallic raceway or type MI cable.

(c) may be armored cable, type MI cable, or any type of metallic raceway system.

Which is correct? a? b? or c?

7. In a commercial garage, for pendants:

(a) flexible cord suitable for the type of service and approved for hard usage shall be used.

b) flexible cord suitable for the type of service and approved for extra-hard usage shall be the only type used.

(c) armored cable with a lead sheath shall be used.

Which is correct? a? b? or c?

8. In a commercial garage, for connection of portable lamps or appliances:

(a) flexible cord suitable for the type of service and approved for hard usage shall be used.

(b) flexible cord suitable for the type of service and approved for extra-hard usage shall be the only type permitted to be used.

(c) armored cable with a lead sheath shall be used.

Which is correct? a? b? or c?

9. When a pendant is used to supply a portable lamp or appliance, the connector:

(a) shall be of the twist lock type.

(b) may be of the twist lock type.

(c) shall be designed to break apart readily in any position.

Which is correct? a? b? or c?

10. In commercial garages, receptacles which are installed above the hazardous area at less than 12 feet above the floor level:

(a) are not required to be provided with any special features not required for any other non-hazardous location.

(b) are required to be of the explosion-proof type.

(c) are required to be of the totally enclosed type or be provided with suitable guards or screens to prevent the escape of sparks or hot metal particles.

Which is correct? a? b? or c?

Correct answers will be found at end of article on page 138.

COMMERCIAL GARAGE
OFFICE AREA IS "SEALED" OFF FROM HAZARDOUS AREA BY 18" ELEVATION OF FLOOR.
OFFICE OR STORAGE AREA
"A"
HAZARDOUS AREA EXTENDS 18" ABOVE GARAGE FLOOR
"B"
18"
18"
"C"
RACEWAY UNDER HAZARDOUS AREA EXTENDING INTO HAZARDOUS AREA TO SERVE OUTLET ABOVE HAZARDOUS AREA.

Fig. 1—A seal is required at point "A" 18 inches above the garage floor where the conduit leaves Class I, Division 2 to supply an outlet above the hazardous area. A seal is required at point "B" where the conduit emerges from the slab in a non-hazardous area. The conduit leaves a hazardous area in a horizontal direction at point "C," but this point is not accessible. Hence, the seal is placed at point "B" with no coupling or other opening between the slab and the seal.

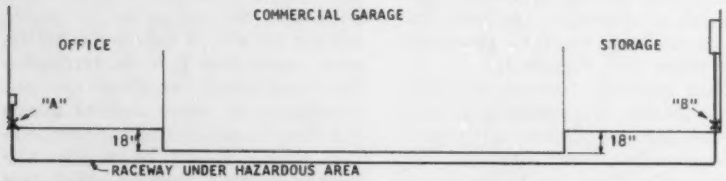

Fig. 2—The raceway under a hazardous area supplies an outlet outside of the hazardous area and does not extend up into the hazardous area at any point. Seals are not required in this raceway unless the underground raceway runs within 20 feet horizontally of a gasoline dispensing island, gasoline fill pipe, or gasoline vent. If the raceway does run within a 20-foot radius of any of these, seals are required at points "A" and "B" where the conduit emerges from the slab and no couplings or other openings are permitted between the slab and seals.

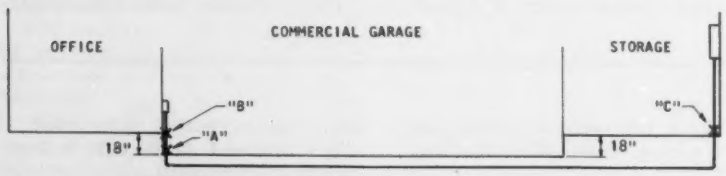

Fig. 3—Where underground raceway runs within a 20-foot radius of a pump, fill pipe, or vent, it is in a Class I, Division 1 area. The garage floor is a Class I, Division 2 area from the floor up to a point 18 inches above the floor. Hence, by a very strict and literal interpretation of the Code, a seal could be required: at point "A" where it emerges from the floor and goes from a Division 1 to a Division 2 area; at point "B" 18 inches above the floor where it goes from a Division 2 to a non-hazardous area; and at point "C" where it emerges from the slab into a non-hazardous area. However, since an 18-inch leeway is permitted for the placement of some seals, many inspectors do not require a seal at "A" — the seal at "B" serves for both.

however, are prohibited from being used for this purpose by a strictly literal reading of Section 511-5 because this section states that only *metal* raceways are permitted.

But Section 358-2 specifically permits cellular concrete floor raceways for ceiling outlets and extensions below the floor in commercial garages in the same manner as is permitted for cellular metal floor raceways by Sections 511-5 and 356-2. It is therefore permitted by the Code.

Of course, an equipment grounding conductor would have to be run with the circuit conductors inside of the cellular concrete floor raceways.

Pendants permitted

Pendants in commercial garages are permitted if flexible cords suitable for hard usage are used. Portable lamps and appliances, on the other hand, are required to be equipped with flexible cords which are suitable for *extra*-hard usage.

Most inspectors would like to require that pendant fixtures be grounded and all receptacles above the hazardous area in commercial garages be of the three-pole grounded type as is required in Class I hazardous areas for both Divisions 1 and 2 by Section 501-12 for receptacles and by Sections 501-9(a-3), 501-9(b-3), and 501-11 for pendants.

But for such equipment *above* the hazardous areas in commercial garages, Paragraphs (d) and (e) of Section 511-5 require only that the identified conductor be connected to the screw shell of lampholders and to the identified terminal of appliances.

Paragraph (e) further requires that, for pendant type receptacles, they be so designed that they will break apart readily from any position and that the female part be connected to the source of current supply and suspended at a level which is above the hazardous area.

Attachment receptacles of the fixed type are required also to be installed above the hazardous area.

Receptacles

Receptacles which are approved for Class I areas are permitted by Section 501-12 to be installed inside of the hazardous areas despite the wording in Paragraph (e) of Section 511-5 requiring receptacles to be above the hazardous area.

Paragraph (e) of Section 511-5, though perhaps misleading, is so worded, no doubt, because it is concerned only with wiring above the hazardous area. It might be less confusing, perhaps, if this paragraph were reworded to state that receptacles must be kept above the hazardous area unless of the type approved for Class I locations and properly grounded.

Section 511-6 governs equipment, as distinct from wiring, which is installed above the hazardous areas as follows: Equipment which is less than 12 feet above the floor and which may produce arcs, sparks, or hot particles is required to be of the totally enclosed type or be provided with suitable guards or screens to prevent the escape of such arcs, sparks, or hot particles.

Examples given by this section of the type of equipment which is within this category include switches, receptacles, charging panels, generators, motors, and similar equipment having make or break contacts.

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Just how a female pendant pin-plug connector permitted by Paragraph (e) of Section 511-5 complies or is assumed to comply with the requirement in Paragraph (a) of Section 511-6 for receptacles to be totally enclosed or be provided with guards or screens to prevent the escape of arcs, sparks, or hot particles is not entirely clear.

Most inspectors, however, do permit ordinary wall switches and wall receptacles as well as pendant receptacles above the hazardous areas; although, as mentioned above, most inspectors prefer, and some—perhaps most—insist that the receptacles be of the grounded type.

(Section 250-45 requires grounding type receptacles for portable equipment where installed in wet, damp, or conductive locations, which would include a very substantial portion of most garage floors.)

Lighting fixtures

Fixed lighting fixtures or lampholders which are located over traffic lanes or which are otherwise exposed to physical damage are required to be mounted not less than 12 feet above the floor

(Continued on page 136)

Questions on the Code

(Readers are invited to send in questions which they would like to see discussed in this department.)

Is there a distance limit for disconnecting means?

QUESTION: Does Section 600-2-(a) of the Code consider a switch or breaker installed at a distance of 50 feet or more to be out of sight from a sign or outline lighting installation?

If not, is there any distance limitation for a disconnecting means on such an installation?

ANSWER: The term "in sight from" is defined in Section 430-4 (Article 430—Motors, Motor Circuits and Controllers) as follows: "Where in this Article it is specified that some equipment shall be 'in sight from' another equipment, it means that the equipment must be visible and not more than 50 feet distant."

However, Article 600—Electric Signs and Outline Lighting — makes no mention of distance. Section 600-2(a) merely states, "The switch or breaker required by Section 600-2 shall be within sight of the sign or outline lighting which it controls or may be located elsewhere when capable of being locked in the open position."

The term "within sight" or "in sight from" is not defined in Article 600, nor is there a fine print note listing any maximum distance.

A fine print note at the beginning of Article 100—Definitions—states, "General guides for this Article on Definitions include: (1) for simplicity, only definitions essential to the proper use of this Code are included; (2) only those terms used in two or more Articles are defined in full in Article 100, other definitions being defined in the individual Article where they apply. . ."

Therefore, since (1) the term "within sight" or "in sight from" is *not* defined in Article 100, since (2) the term as defined in Article 430 is qualified by the clause "where within this Article it is specified," and since (3) Article 600 does not specify any maximum distance, there is no Code limitation on the distance between the sign or outline lighting installation and its disconnecting means.

The local inspection authority must determine whether such a disconnecting means is "within sight." He has, of course, some basis for establishing a distance of 50 feet by the use of this distance in Article 430.

Basing a decision on these grounds, however, is a questionable practice. Some Code rules are more firmly established than this. For instance, the well established "five feet horizontally and eight feet vertically" mentioned in the Code as the bounds "within reach," although perhaps awkwardly stated in regards to the vertical distance, is nevertheless soundly based upon a reasonable "arms length reach" of a man.

Hence, this is good grounds for basing a decision on whether equipment is within reach, even though a set distance may not be given in regard to the piece of equipment in question. But the distance of 50 feet, when taken as the bounds of sight range, is an arbitrary distance only and has questionable relationship to the range of normal eyesight or to the distance at which a sign electrician is able to discern whether a switch is about to be closed which would endanger his life. Unless this distance is defined beforehand then, as it is in Article 430, the inspector should not use it. Instead, he should make his decision by actual observation while at the location of the sign or outline lighting installation.

If he cannot see the switch or breaker from *all points* about the installation, he can rule that it is out of sight.

What does Code mean by 'readily accessible'?

QUESTION: The inspector rejected a service I put in a multiple occupancy building, stating that it was not accessible to the occupant which it served.

But I put a panel with branch circuit overcurrent devices in a place which was accessible to the occupant, and these overcurrent devices are lower in rating than the 100-ampere overcurrent device in the service equipment. This is in compliance with Section 230-92. Please give your interpretation.

ANSWER: Section 230-92 states, "Where the service overcurrent devices are locked or sealed, or otherwise not readily accessible, branch-circuit overcurrent devices shall be installed on the load side, shall be mounted in an accessible location and shall be of lower rating than the service overcurrent device."

You should note that this quoted section says that this applies when the service is not "readily accessible." It does not say when not accessible. If locked or sealed, it is not *readily* accessible.

Section 230-90, Exception No. 4, states, "In a multiple occupancy building each occupant shall have access to his overcurrent protective devices." This refers to service overcurrent devices as mentioned in the basic statement of this section, to wit: "Each ungrounded service-entrance conductor shall have overcurrent protection."

Following this comes the requirement, quoted above, for accessibility. Therefore, the occupant is required to have access to his service overcurrent device; and if it is locked, sealed, or otherwise rendered not *readily* accessible, the additional provisions regarding the branch circuit overcurrent devices are required. Actually, these branch-circuit overcurrent devices are required to be accessible in any case by the provisions of Section 240-16, regardless of where the service overcurrent device is placed. In fact, they are required to be *readily* accessible.

Section 230-70(b) requires the service disconnecting means to be readily accessible also.

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This symbol stands for QUALITY

NOW... BullDog plug-in duct hangs up to 50% faster

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If yours is one of the 45,000 participating companies, this anniversary year offers a good reason for renewed promotion. For help and suggestions, contact your State Savings Bonds Director, or write: **U.S. Savings Bonds Division, Treasury Department, Washington 25, D.C.**

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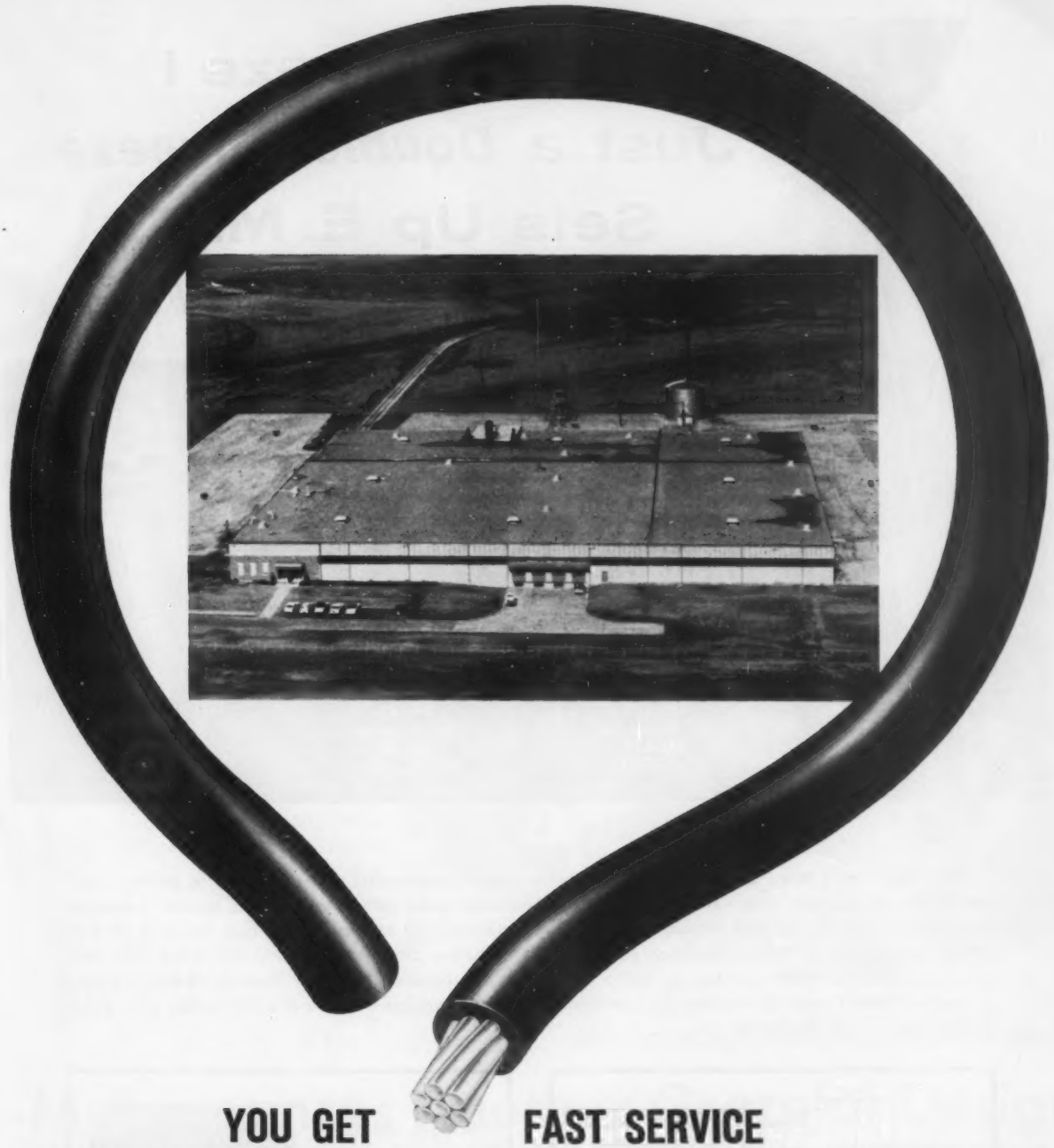

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Just a *Double Squeeze*

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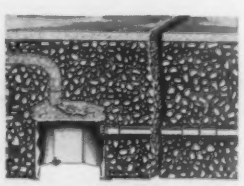
B-M Offset Connector, showing how wires are guided over box edge.

Briegel All Steel Indenter Fittings are U.L. approved as Concrete-Tight.



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All B-M indenter type fittings far exceed the requirements of U. L. file card E 10863 and Federal Specifications W-F-406.

USED THE MOST FROM COAST TO COAST

ADDED BEAUTY FOR LOCATIONS like this. The Styled Mercury unit directs the light downwards and eliminates glare. It illuminates 11,000 square feet to 3 footcandles. You need fewer and shorter poles, and less wiring, to get the desired level of light.

ANOTHER IN THE FAMILY of modern Styled Mercury luminaires. The entire line is all-aluminum, with Holophane® refractor. Choice of 1000, 700 or 400 watt ratings. Available in choice of brushed aluminum finish or five decorator colors.

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FOUR OF THE LATEST design units provide excellent nighttime illumination for traffic and pedestrians on this busy street in a shopping section.

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Line Material's Styled Mercury luminaires are a family of high quality, high intensity lighting units. The latest addition to the Styled Mercury line is the upsweep design installed in the well-lighted street shown above.

These are large, handsome luminaires, styled for Line Material by a noted industrial designer. They will contribute daytime beauty and excellent nighttime lighting to any street, park, mall, public square, or parking area.

Line Material is a leading manufacturer of outdoor lighting with 50 years' experience in the design and application of street and highway luminaires. L-M also provides competent Lighting Application Service by experienced lighting engineers.

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Please send me details on L-M Styled Mercury family of luminaires and the new units. ES-101

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Company_____

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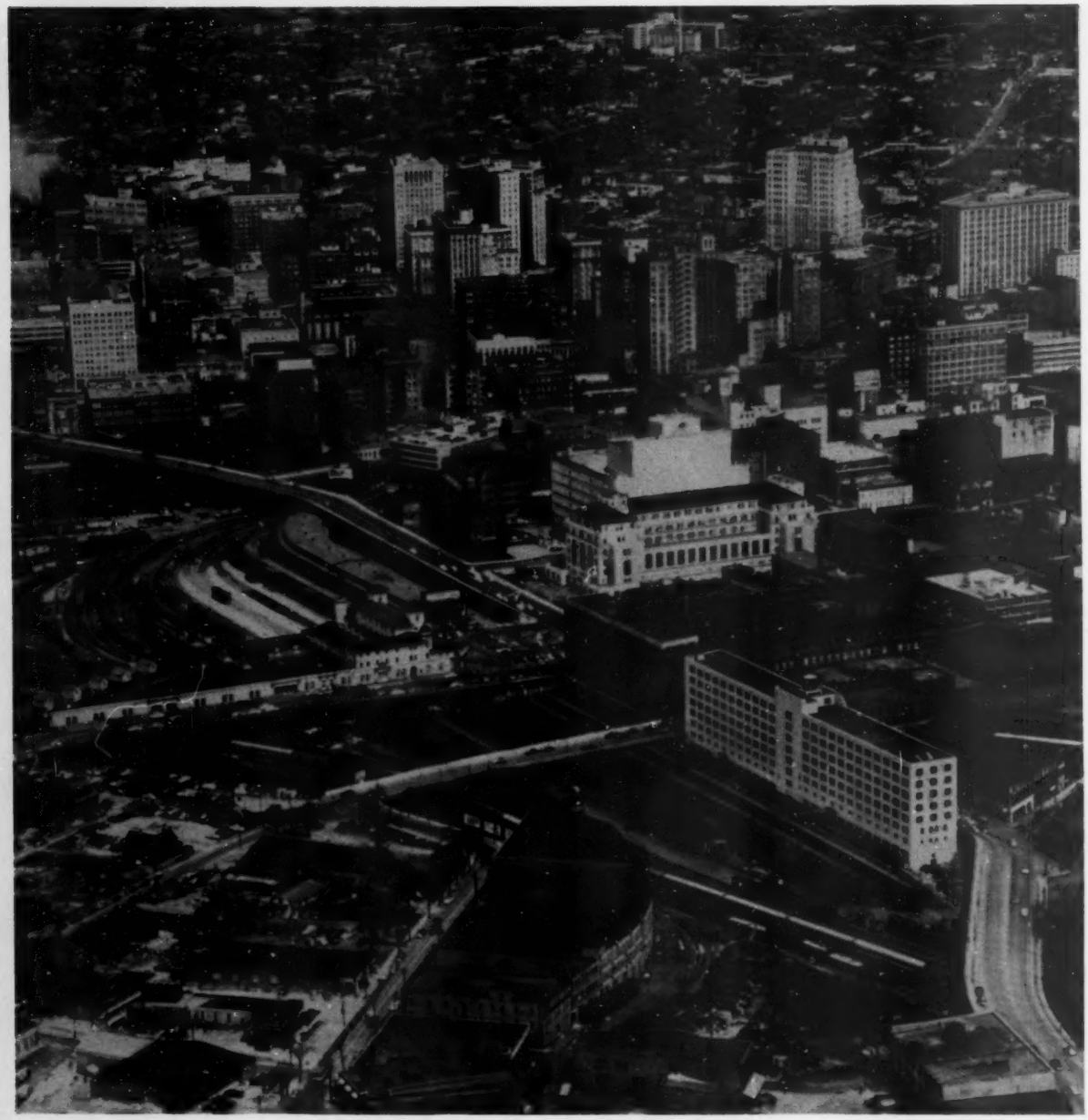
City_____ State_____

Type of Area To Be Lighted_____



Everything Is Peaches...

Atlanta, the state capital of Georgia, is the principal railway center of the South. This city of skyscrapers and nationally-known Peachtree Street is served by 15 lines of eight railways, and owes its existence and development to transportation.

Railways and electric power signify growth in any city, and Kerite has served railroads and electric utilities everywhere with cable that has been a standard of dependability since 1854. Kerite has grown with these and other industries through the years. *When tomorrow's problems occur—Kerite will already be ahead of them.*

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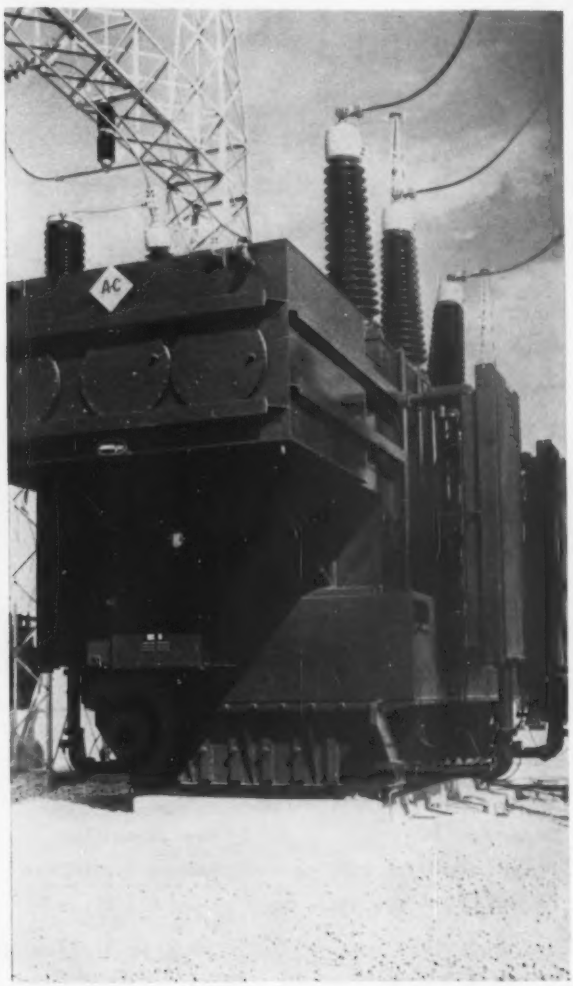

Mobility for substation transformers—page 95

Capacitors solve "joint-use" problem—page 90
Relaying for spot network service—page 92
Tap changing design reduces transformer size—page 95
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Model J-2-275 (actual size)

Now—Precision withstands any lightning surge better

Compare this *new* Precision Omega with any other photocontrol at any price. You can *see* the engineering distinctions that make Precision's 2-component circuit (plus lightning arrester) the exclusiv choice for lightning-proof multiple lighting in Key West, Florida.

Lightning surge — low- or high-voltage — can't phase the operational dependability of Precision "Omega" with its oversize lightning arrester — the most effective ever used in street lighting controls.

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The difference between night and day

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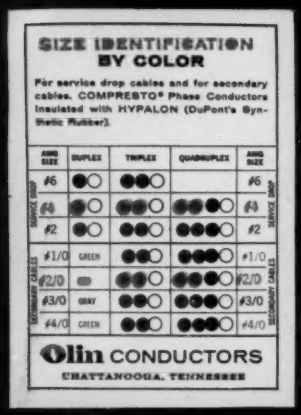

FREE! Large self-adhesive Size-Identification Color-Chart . . .

Now measure wire by color!

Olin Conductors—creators of color for secondary cable over a year ago—now announce another industry "first": SIZE IDENTIFICATION BY COLOR in service drop cable!

Olin Conductor's COMPRESTO® has been combined with DuPont HYPALON* to create a "one shot" 600 volt insulated jacket that has insulation resistance values consistent with that usually found only in regular TWO-COAT type service drop cables.

Because of its superior **natural** resistance to weather, oxygen and ozone, colored Hypalon covering does not require large quantities of carbon black. Thus, Compresto size-by-color service drop may be colored with industry accepted—lasting—color coding, without damage from the sun's ultraviolet rays. In fact, Compresto with Hypalon in color has a longer life—weathers better—than the best grade of black in any other commercially available compound!

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	BLACK	RED	GRAY	GREEN
AWG Size	#6	#4	#2	#1/0
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make your own scale model "SMRT"

New ALLIS-CHALMERS SURFACE-MOUNTED RESIDENTIAL TRANSFORMER

fully compartmentalized for safety!

- **Lower than your office desk** — only 28½ inches high and narrow enough to install between the sidewalk and the street.
- **Removable cable compartment** — lets you install HV and LV cables first; then position cable compartment and bolt into place. HV standoff insulator holds HV cables when moving transformer.
- **Light weight** — 50-kva unit weighs only 750 lbs. Does not require large crew or heavy handling equipment.
- **Disconnect switch and secondary breaker handles are on LV side**—safely away from HV terminals.
- **Tamperproof mechanically interlocked compartment doors** — HV compartment has steel isolation barrier to protect personnel from primary circuit.
- **Green finish blends harmoniously with surroundings.**

ENDUR-ALL "locked" core and coil gives you *more value*:

- **higher-temperature oil and wire insulation**
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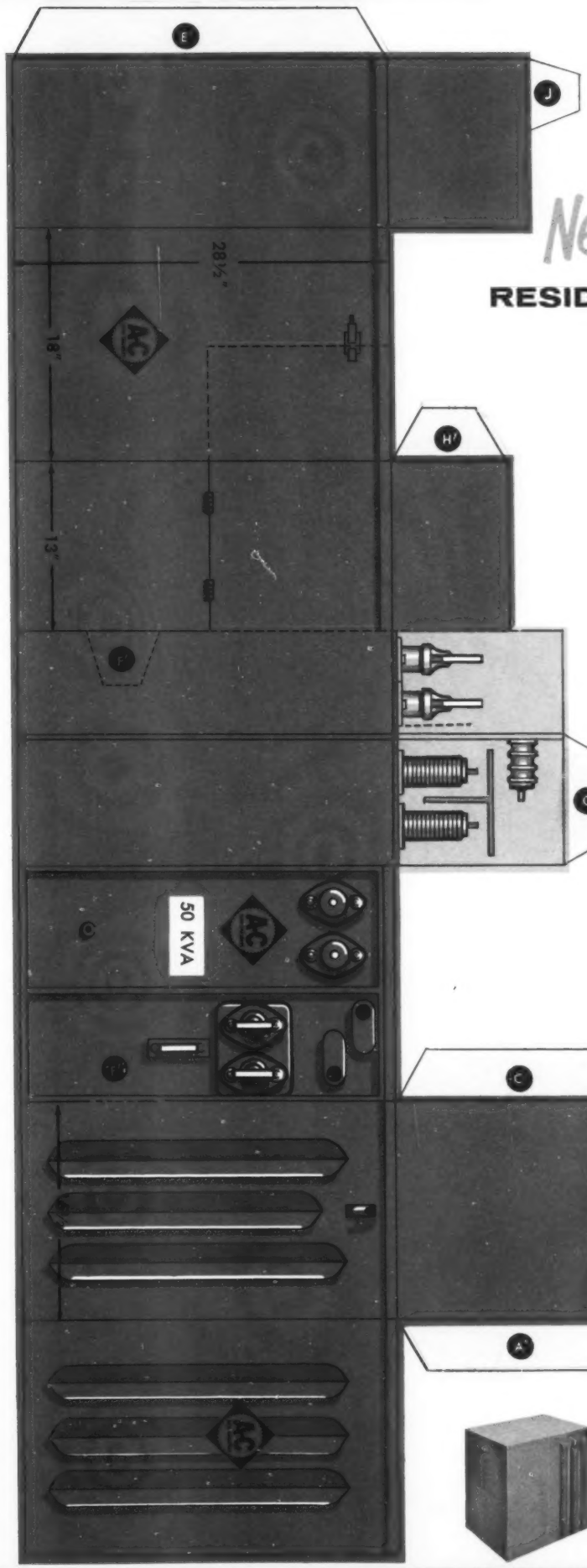
Remarkable *new* Allis-Chalmers single-phase, surface-mounted residential transformers are available in 25, 37½ and 50-kva sizes, 15 kv and below.

ENDUR-ALL is an Allis-Chalmers trademark.

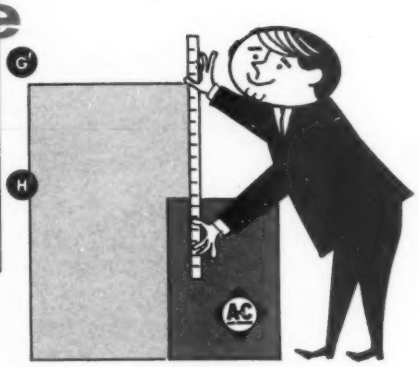


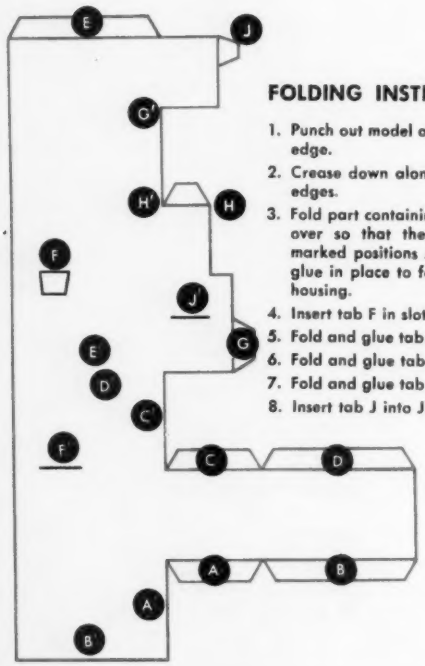
FOLDING INSTRUCTIONS ON OPPOSITE SIDE FOR MODEL OF NEW "SMRT"

A-1528

COMPARE SUPER-COMPACT ALLIS-CHALMERS SURFACE-MOUNTED RESIDENTIAL TRANSFORMERS WITH ALL OTHERS!

"SMRT" is less than ¼ the size of the average of six other makes





FOLDING INSTRUCTIONS

1. Punch out model along perforated edge.
2. Crease down along all scored edges.
3. Fold part containing tabs A B C D over so that they are opposite marked positions A' B' C' D' and glue in place to form transformer housing.
4. Insert tab F in slot F'.
5. Fold and glue tab G to G'.
6. Fold and glue tab E to E'.
7. Fold and glue tab H to H'.
8. Insert tab J into J'.

Check the chart below! It introduces you to new dimensions in surface-mounted residential transformers. Example: the A-C 50-kva "SMRT" is just 28½ inches high, 29 inches deep and 18 inches wide! That's just 15,660 cubic inches of cabinet compared to competitive cabinets as large as 83,927 cubic inches. Smaller size means easier shipping and handling. Foundation, labor and equipment costs are lower.

E'

D'

C'

A

B'

Dimensions of A-C 50-kva Surface-Mounted Residential Transformers "SMRT" compared with six other makes

Make	A-C	Brand A	Brand B	Brand C	Brand D	Brand E	Brand F
Height	28½	41	46	43	38¼	38½	42
Depth	29	34	44½	48½	40	45	49
Width	18	36	41	40	37	40	36
Cubage	15,660	50,184	83,927	83,420	56,610	69,300	74,088
% larger than A-C	—	220%	440%	430%	260%	340%	370%

Weights of competitive units are correspondingly greater.

Write, wire or phone your nearby A-C office for more surface-mounted residential transformer facts or copies of Ad A-1528. Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

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Pacing Power Progress

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Originators of 5/8% Step Regulators

A-1474

1960 FIRST short-circuit withstand of 40 times Vari-Amp current

1959 FIRST standard electrical drag-hand reset

1958 FIRST with Caliband control

1952 FIRST frictionless voltage-regulation relay

1940 FIRST Vari-Amp feature

1939 FIRST unit construction

1938 FIRST unidirectional breather

1935 FIRST voltage integrating time delay

1933 FIRST ⅛% step regulator

"Firsts" are important—they signify the extensive research, development and leadership at Allis-Chalmers. This program gives you the SFR regulator with its *33% saving in space . . . 30% lower cost per kva . . . 20% less weight.* And continuing research and development provides these additional SFR benefits:

78 fewer bolted connections, faster untanking and testing, all connections in full view—thanks to unit construction.

Fast, accurate control settings—assured by exclusive *Caliband* control.

Oil deterioration reduced—moisture and combustible gases eliminated by the unidirectional breather.

Operation at greater-than-nameplate current when range of regulation is reduced, with *Vari-Amp* position indicator.

Positive series winding protection, by externally mounted regulator by-pass arresters.

These are only a few of a number of benefits you get with Allis-Chalmers SFR feeder voltage regulators. For all the facts — call, wire or write your nearby **Allis-Chalmers** office.

Caliband and Vari-Amp are Allis-Chalmers trademarks.

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EASY DOES IT...

with the right lubricant for each cable-pulling job

Save time and money installing cable in conduit . . . protect cable from damage . . . assure service continuity . . . with a cable lubricant engineered for your job's requirements.

Because conditions vary from job to job—diameter and length of cable, kind of insulation, number of bends, friction in the duct—Burndy provides these four tested cable lubricants, for a variety of service conditions. One of the four is the Burndy lubricant for your job . . . ask Burndy to help you select the cable-pulling lubricant you need.

Burndy SLIKON, for cable covered with rubber, many kinds of plastic, or lead, for installation in steel or aluminum conduit.

Burndy ALBENTONITE CABLE LUBRICANT, for cables with polyethylene and similar insulations.

Burndy IMPROVED CABLE PULLING COMPOUND, specifically for lead-covered cable for installation in ducts of all types.

Burndy PROTECTANT 626, for lead covered cable for installation in ducts and manholes subject to flooding and other severe conditions.

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ANOTHER HOLAN FIRST

NEW LD-40 ELBOW

WITH HIGH DIELECTRIC STRENGTH, OFFSET YOKE *

One-step entry into the bucket at the rear of the truck is possible because of the offset yoke*.

*Patents applied for.

You save time right from the word "go" with the new Holan LD-40 Elbow. One step and you're in the easy-entry bucket. And one man controls every movement of the Elbow.

Ideal for re-fusing transformers, mid-span trouble work, installing customer service, insulator inspection, street light maintenance, telephone drop installations from mid-span — even maintenance of railroad catenary systems.

The exclusive offset yoke* not only facilitates bucket entry — *it increases versatility and working range.* Angle of the yoke — coupled with 90° lower arm, 135° upper arm travel — permits work over parked cars, over and between power and telephone lines, and on the property side of the pole. It reaches up 40', rotates 360° continuously in either direction.

It's safe, too. The molded fiberglass reinforced plastic bucket, yoke and upper arm can withstand a bucket-to-ground dielectric test in excess of 100,000 volts (A.C.).

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Subsidiary of THE OHIO BRASS COMPANY

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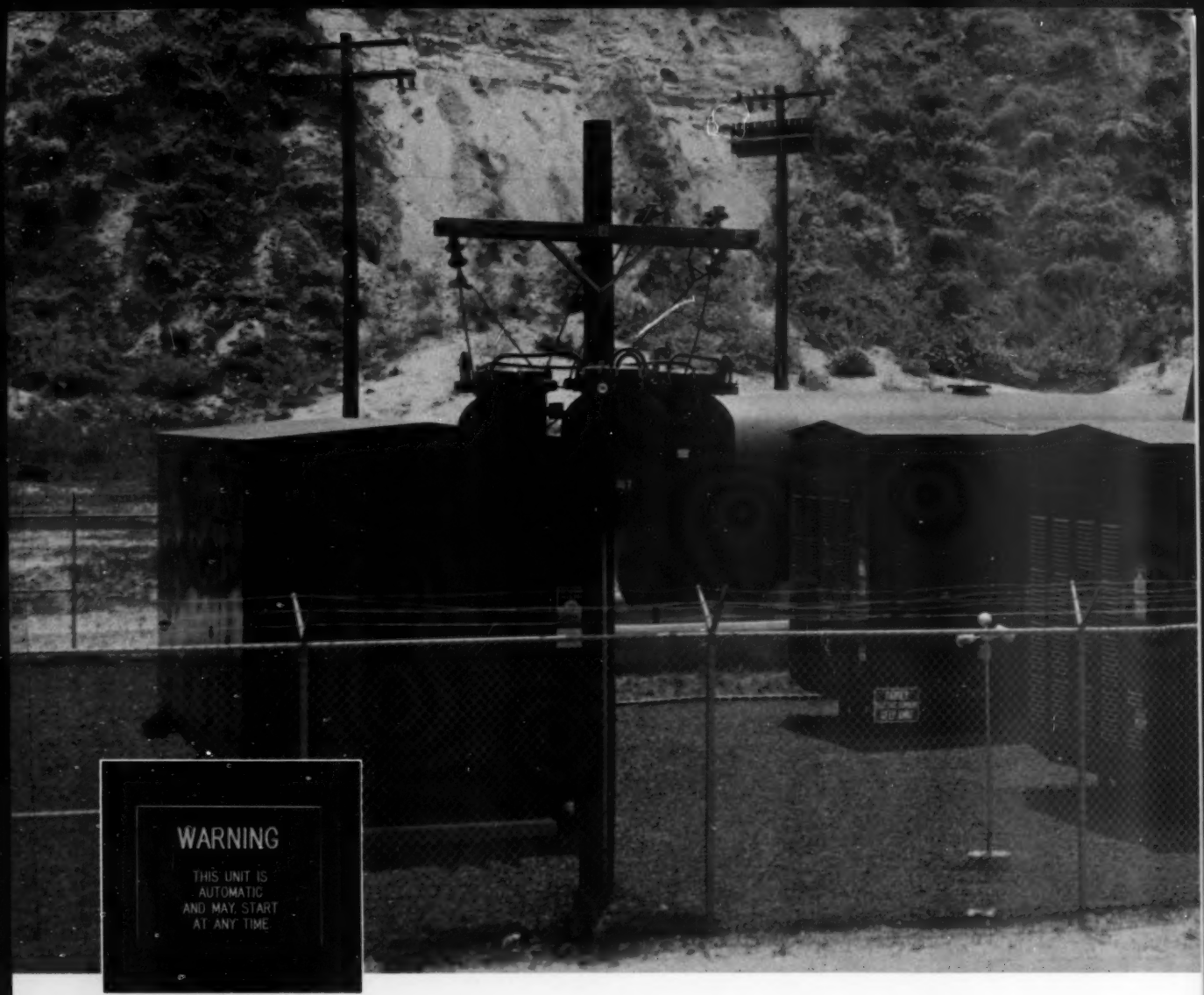


Long Island Lighting picks Diesel Peaking

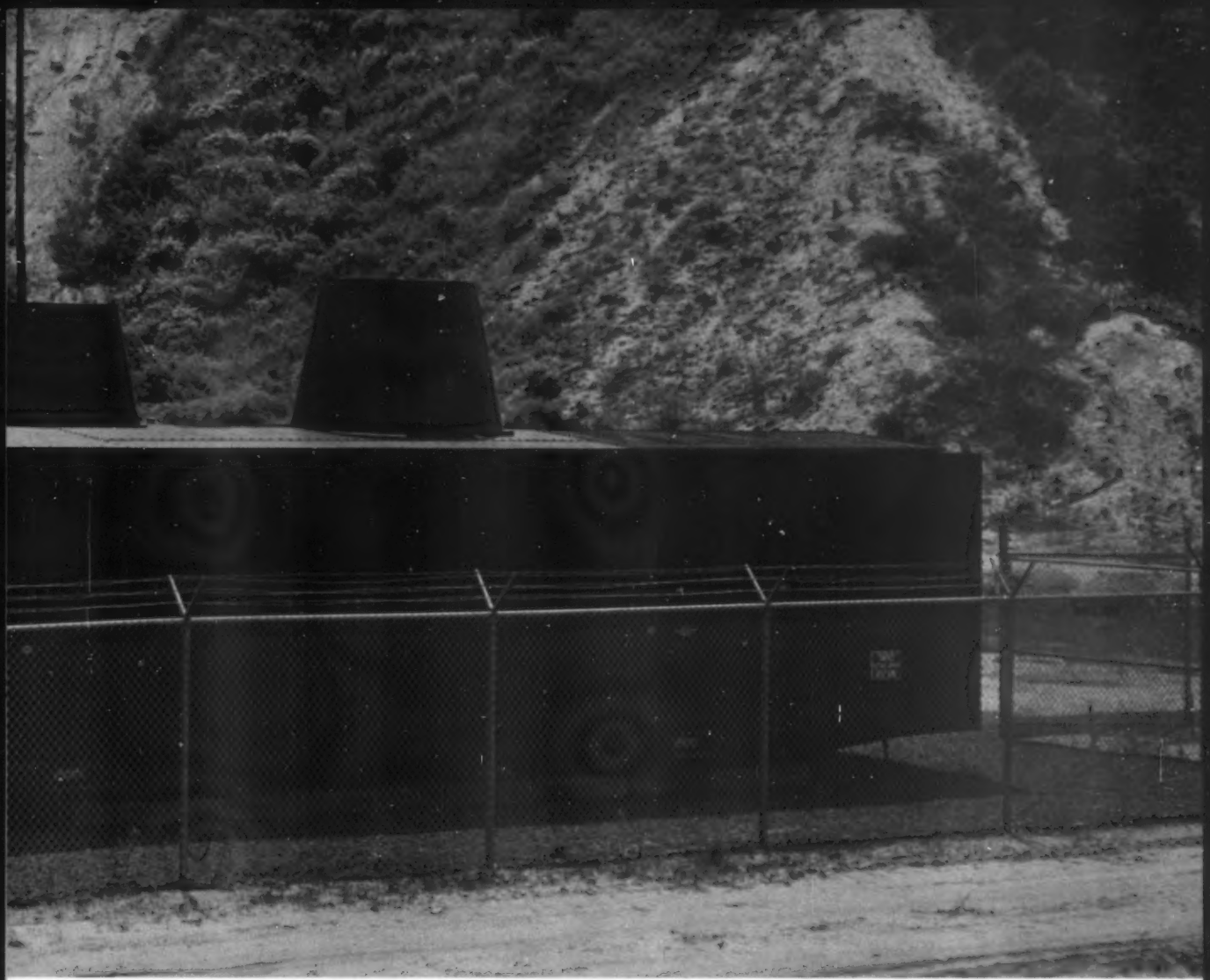
Long Island Lighting Company has installed a 4000 KW Electro-Motive Peaking Plant at Northport, Long Island to provide area protection and spot peaking by remote control.

The Plant is designed to also supply construction power and emergency starting power for a large steam plant now being built.

WARNING—THIS UNIT IS AUTOMATIC: This sign, which is attached to the Electro-Motive Plant, points up an important operating feature. In the event that a line outage occurs at any time, and attempts to reclose fail, an automatic signal starts the Electro-Motive Plant. It comes up to full speed, synchronizes and loads in less than two minutes to provide emergency area protection. When service is restored, the Electro-Motive Plant automatically shuts down.

PEAKING SERVICE: In addition to providing emergency protection for the area, the Electro-Motive Plant will function as a spot peaking power generator. For this service it will be operated by remote control from the Hicksville Operations Center. And the quiet smoke-free operation of the Diesel Plant makes it ideal for its suburban location.

ADAPTABLE TO MANY FUNCTIONS—The inherent design characteristics of the Electro-Motive equipment on the Long Island Lighting



Plants for economical area protection

system that make it ideal for peaking and area protection, also make it well suited for many of your system requirements:

- fast start for spinning reserve
- automatic dead load pick-up for area protection
- unattended operation for remote peaking service
- freedom from damage to components caused by rapid thermal changes occurring from start to full load.

Available in units from 2000 KW to 10,000 KW, the Electro-Motive peaking equipment line contains both Diesel and dual-fuel plants that permit matching the plant to exact requirements for the most economical and efficient operation at the lowest investment. Ask your Electro-Motive representative for details.

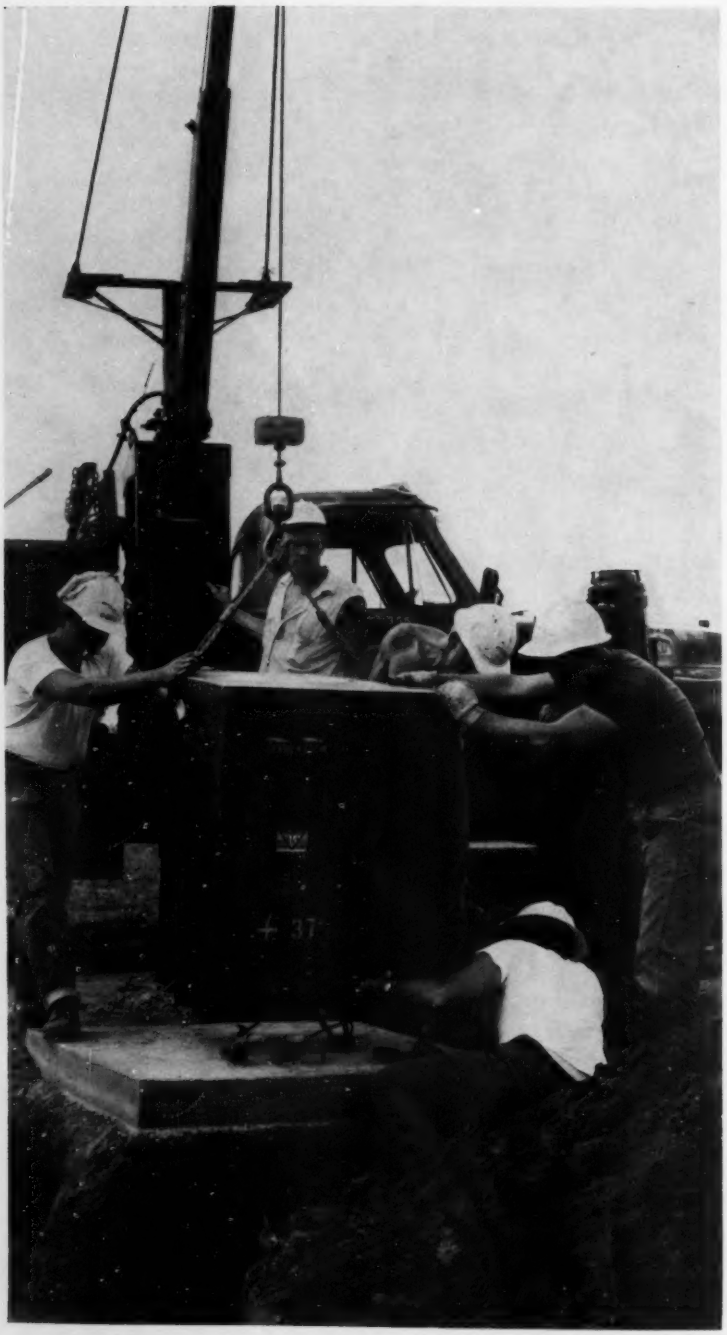
ELECTRO-MOTIVE DIVISION · GENERAL MOTORS

LA GRANGE, ILLINOIS

In Canada: General Motors Diesel Limited, London, Ontario

Utility develops improved methods

Difficulties in reinforcing existing underground facilities led Union Electric



A Union Electric crew is setting a pad type transformer in place.

By W. K. Smith, Superintendent, Safety Dept., Union Electric Co., St. Louis, Mo.

◆ The installation of underground distribution facilities to supply customers in residential areas is not a recent development at Union Electric.

Actually the first underground service of this type dates back to 1911 and it consisted of 120/240-volt lead-covered buried cables. Subsequent underground systems to supply subdivisions consisted of a single-phase cable connected to adjacent overhead lines supplying 2,400- to 120/240-volt transformers.

Reserve circuits were not provided with the exception of one subdivision of large estates. In the early installations the primary cables were buried and prior to 1939 consisted almost entirely of Nos. 8 or 6—two-conductor, paper-insulated, lead-covered, steel-armored cable, the first being installed in 1913. The secondary and service cables were also paper-insulated, lead-covered.

In 1939, the first non-leaded four-kv primary and secondary service cables were installed and have been used since then. Submersible type transformers were installed in most cases with protective and disconnecting devices consisting of oil fuse cutouts and disconnect potheads. Manholes generally were of two sizes, five by five by six feet and four by four by four feet, which were constructed in the field and usually not provided with drains.

Several types of service joint boxes were used, which included open boxes of fiber or sewer tile, fused junction boxes, brick or poured concrete handholes, and also some buried connections in fiber conduit.

It is very apparent that a primary cable fault on a buried cable radial supply can and did result in long outages to the connected customers with resultant serious complaints. With the advent of residential air conditioning begin-

# of installing residential UG service

to design economical installations for adequately serving future loads

ning in the early 1950's and reaching a peak in the hot summer of 1954, the old existing facilities were generally overloaded, resulting in outages from transformer failures and low voltage to the customer.

This required making numerous emergency installations at considerable cost to Union Electric since reinforcing of existing facilities, including maintenance, is financed entirely by the company while new facilities are financed by the customer on the basis of cost difference between underground and the equivalent overhead construction.

Complete study made

As a result of the above problems in 1954, a complete study was made of our underground practices—considering the importance of quality and continuity of service. The main consideration was that those facilities which are not easily replaced must be installed to serve loads of 20 years in the future.

This study resulted in several changes in construction, the major one being that the initial installation in new subdivisions would include conduit and manholes for the anticipated ultimate requirements. The installation of three-inch Transite conduit without concrete encasement except in bad ground conditions was established as a standard.

In place of poured concrete manholes and handholes, precast concrete units would be installed. These consisted of three standard sizes: transformer manhole—five-foot, six-inch diameter with a six-foot depth cast in two-foot sections with a floor slab and removable roof slab; small transformer manhole—four-foot diameter with a four-foot depth cast in one section with a removable roof slab and no floor; and a handhole for service connections — two-foot diameter with a three-foot depth with a removable cover and no floor.

Cable installation was standardized to use a No. 6 one-conductor, five-kv concentric type cable with oil base rubber insulation and neoprene jacket as the primary and a No. 4/0 three-conductor twisted network cable for the secondary.

It was further decided that in new installations overhead type transformers would be used. This decision required that in transformer manholes a sewer drain be installed where available or otherwise a sump pump be provided for drainage.

The above practice then became our standard for installation of underground facilities to serve residential subdivisions in 1954. It should be recognized that the installation of underground facilities as previously described is an expensive arrangement.

This certainly would tend to discourage a subdivision developer or customer who might be considering underground service since he is required to pay the difference in cost between underground and overhead service.

Recent trends

In 1956, Union Electric began participating in a joint EEI-Bell System subcommittee to study residential underground construc-

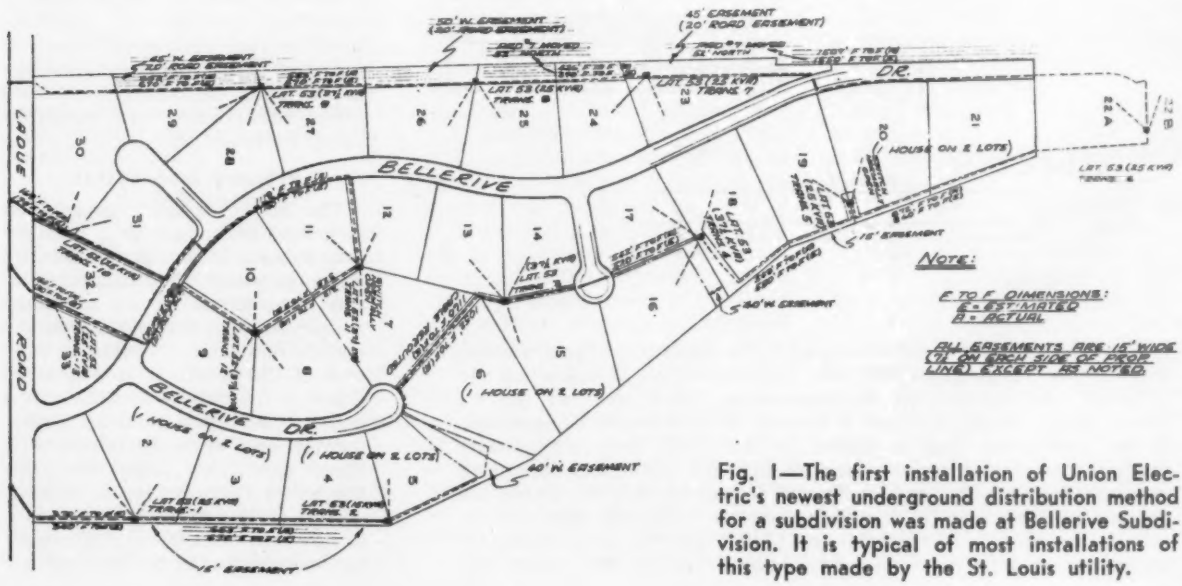
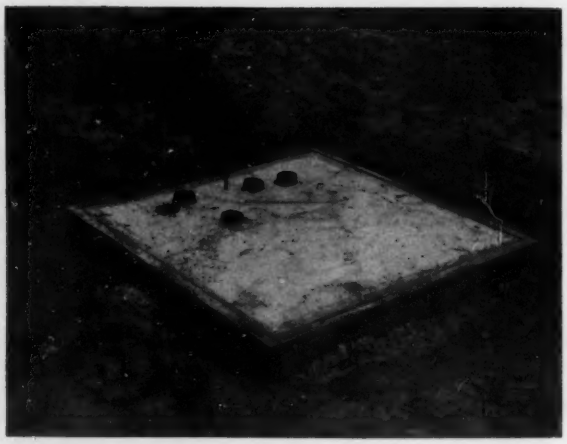

LADUE ROAD
BELLERIVE
BELLERIVE DR.
(1 HOUSE ON 2 LOTS)
NOTE:
E TO F DIMENSIONS:
E = ESTIMATED
A = ACTUAL
ALL EASEMENTS ARE 15' WIDE (7½' ON EACH SIDE OF REAR LINE) EXCEPT AS NOTED.

Fig. 1—The first installation of Union Electric's newest underground distribution method for a subdivision was made at Bellerive Subdivision. It is typical of most installations of this type made by the St. Louis utility.



The framework is still in place around this poured pad.

Two precast transformer pads are ready for placement.

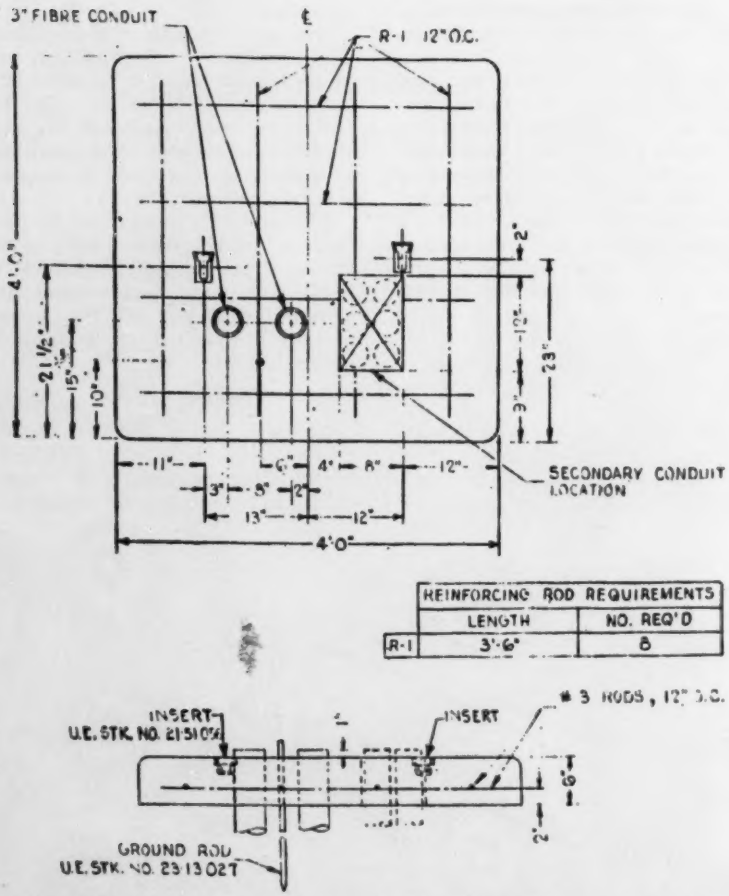


Fig. 2—The standard transformer pad is for single-phase, pad-mounted transformers 15 through 100 kva. The installation is made by the customer, who furnishes all materials except the ground rod and the inserts. Earth beneath the pad is tamped to a 90-degree compactness. If the transformer pad is poured in the field, three-inch primary conduits, three-inch secondary conduits, 5/8-inch inserts, and the ground rod are encased in the pad. If the pad is precast, only the inserts are encased in the concrete, four-inch diameter holes are provided for primary conduits, and an eight- by 12-inch opening is provided for secondary conduits. A one-inch hole is provided for the ground rod.

tion. In conjunction with the study of this subcommittee, studies were made by our engineering department to determine ways of reducing costs to our customers for underground supply and still provide reliable service.

Our subsequent experience with sump pumps in transformer manholes had shown that a considerable amount of maintenance was required to keep them in satisfactory operating condition. Aboveground transformer vaults appeared to be the only solution to this problem until the appearance of the pad-mounted transformer for residential underground distribution in 1958.

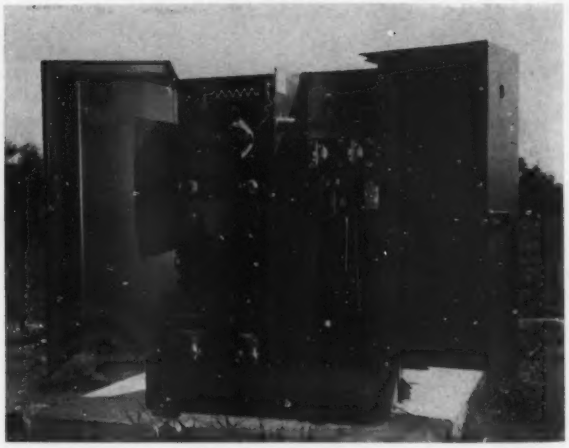
This new type residential transformer was incorporated into an entirely new system for supplying underground service to residences.

We are now in the process of installing underground facilities to serve four residential subdivisions and three apartment developments using the new system. Two other subdivisions are currently being investigated.

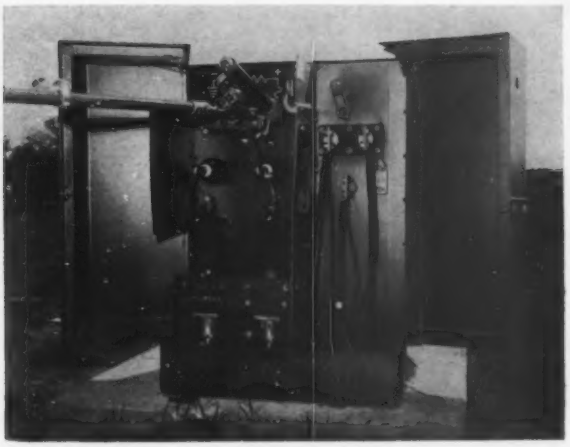
Primary loop system

The system which was adopted is generally known as a primary loop system. It consists of a single-phase primary cable connected to the same phase of an overhead supply through a fused disconnect switch on terminal poles at each end of the cable. It is connected through disconnect switches to a bus at each pad-mounted transformer and each transformer is then energized from the bus through a primary fuse disconnect.

One of the disconnect switches is normally left open at the center transformer in the loop so that



The transformer is in place and the cable is connected.



A load-break device will operate the 12-kv switches.

half of the transformers are supplied from each end of the circuit. Each transformer is protected by the primary bayonet type disconnect fuse and a secondary breaker is provided to clear secondary cable faults.

The customers' secondary cables are connected directly to the transformer terminals or to a secondary cable main in a handhole depending on the load and size of lots. The primary cable installed on the 12-kv system is No. 4 one-conductor 15-kv paper-insulated, lead-covered with a neoprene jacket and a No. 4 one-conductor weatherproof neutral.

On the four-kv system, non-leaded No. 2 one-conductor, five-kv rubber insulated cable with a No. 2 concentric neutral is used. The 15-kv cable is terminated at the terminal poles with 25-kv potheads and at the transformers with 15-kv potheads while the five-kv cable is terminated directly at the switch connections without potheads. The secondary cable mains are 600-volt rubber insulated with a neoprene jacket.

Buried directly

All primary and secondary mains are directly buried without any covering or protection except where they cross paved areas, creeks, or drainage ditches.

This method of installation is based on the premise that better results are obtained by burying the cable deeper without wooden planks or other protection over it. The minimum depth for the primary cable has been set at four feet and the secondary cable at three feet.

Both cables are installed in the same trench with 12-inch vertical and horizontal separation. Whenever a telephone cable is installed in the same trench, it is also separated 12 inches vertically and horizontally above the power cables.

However, our experience generally has been that the telephone company prefers to install their cable in a separate trench or by plowing it in at a depth of about two feet.

When it is necessary that the cable cross under paved areas or areas to be paved, a separate fiber duct encased in concrete is installed at a minimum depth of two feet, six inches.

On occasion where the paving is in place, plastic duct without encasement has been substituted but it must be installed below the gas and water mains in the street with a minimum depth of four feet.

The service cable from the residence to the connection point at the transformer or secondary main handhole is installed, owned, and maintained by the customer. This cable is also buried directly in the ground without any covering for mechanical protection.

In supplying underground service to an apartment building development, the secondary cable from the transformer or handhole to a service entrance box located usually inside the basement of the building is installed and maintained by Union Electric.

This is in accordance with our service policy of providing the service to a distribution point where the various customer service cables are connected. Otherwise, this type of development is handled the same as a residential subdivision. This cable is also directly buried with no mechanical protection.

Three-phase underground service is not offered to residential customers. In one of the apartment building developments, three - phase underground service was required for a large recreation center and this was handled as a separate connection similar to any other load of this type.

A layout of the first installation of our newest underground distribution to a subdivision is shown in Figure 1. This is typical for most installations of this type.

Construction procedures

Construction of the underground distribution system for residential subdivisions is divided between the subdivider or his contractor and the company.

The subdivider or his contractor is required to handle the following phases of the installation, furnishing all materials:

(1) Stake and clear all easements.

(2) Excavate and backfill all trenches.

(3) Construct transformer pads with necessary conduit bends.

(4) Install service handholes.

(5) Install all customers' service conductors to transformer pads or service handhole and connect to customer's service entrance equipment.

(6) Install all concrete-encased fiber conduit required under paved areas and drainage ditches.

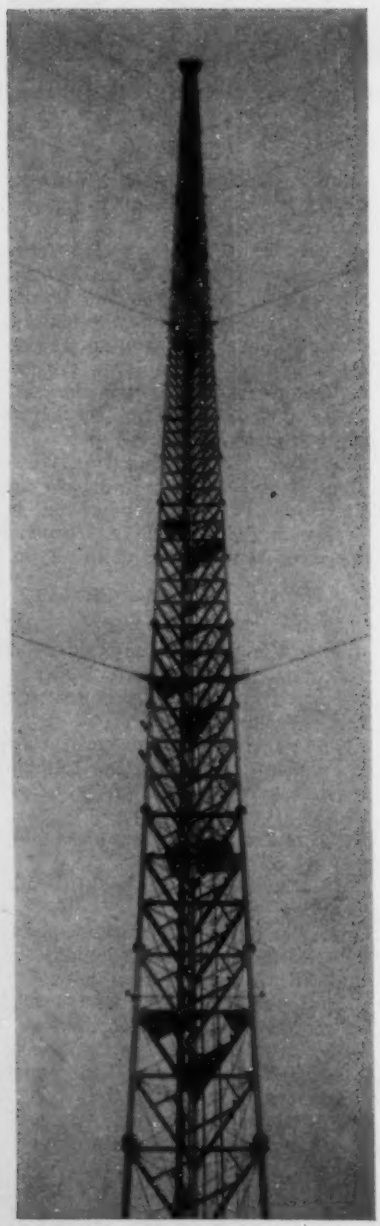
Union Electric furnishes materials and is responsible for the following installations:

(1) Install all concrete-encased

(Continued on page 136)

Capacitors resolve 'joint-use' problem

When a new TV broadcasting tower went into use, excessive noise developed in underbuilt rural telephone lines on a 12-kv primary serving the transmitter



The 1,676-foot tower broadcasts television programs to six states. Each of the sections is 30 feet high.

By Carney C. Fesler, Distribution Superintendent, Missouri Utilities Co., Cape Girardeau, Mo.

◆ Capacitors proved to be an excellent remedy recently for noise that developed in underbuilt rural telephone lines on a long 12-kv primary serving a TV transmitter.

This interesting engineering problem began when KFVS-TV at Cape Girardeau, Mo., made plans to move their transmitter to a new site and to erect a tower which is now the tallest man-made structure in the world.

Selecting the highest point in Cape Girardeau County, the TV station management erected a 1,676-foot tower, 204 feet taller than the famed Empire State Building, giving them a total elevation of 2,486 feet above sea level.

With this increased height the viewing audience would be increased to approximately 2,718,335 people and include parts of six states: Missouri, Illinois, Kentucky, Tennessee, Arkansas, and Indiana. The total area covered is 30,700 square miles, comprising 76 counties. These figures use the standard 100 microvolts per meter measurement.

Available power

The site chosen for the transmitter and tower was just beyond the end of our 7.2-kv distribution with electric loading to the extent that added capacity was already needed.

Also just adjacent to this distribution feeder was another 12-kv line that was heavily loaded, both feeders being within one mile of each other at approximately two miles north of their source of supply.

This made economically possible the tapping of our 34.5-kv subtransmission line that encircles the city, and extending it to this point where a substation could be erected. The substation built was of 1,500-kva capacity and with two circuits, using reclosers, and a regulator-transformer, 34.5 kv to 7.2/12.47 kv wye.

Eleven miles of 7.2/12.47-kv line were rebuilt using 1/0 ACSR the first seven miles and No. 2 ACSR the last four. Extreme care was used throughout design and construction regarding pole class, clearance, anchor lead, and anchor holding power to give reliability.

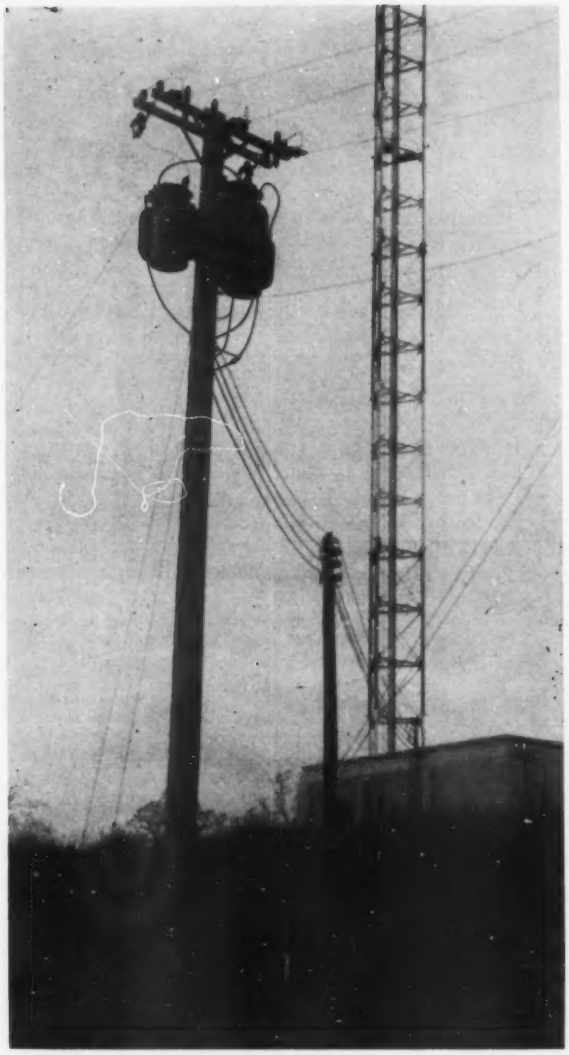
All transformers and tap lines, regardless of how short, were fused with the exceptions of two longer lines where additional reclosers were added. An additional set of regulators was installed at the foot of the hill along the road approaching the tower. The regulator compensation was set to give a flat voltage curve at the main fuses of the transmitter.

Preliminary calculations were made taking primary-voltage drop, transformer-voltage drop, and secondary-voltage drop into consideration; then adjustments were made using the voltmeter to limit the voltage variation to plus or minus 1½ per cent between no load and full load. Power requirements consist of approximately 160 kw at .95 power factor with an 85 per cent load factor.

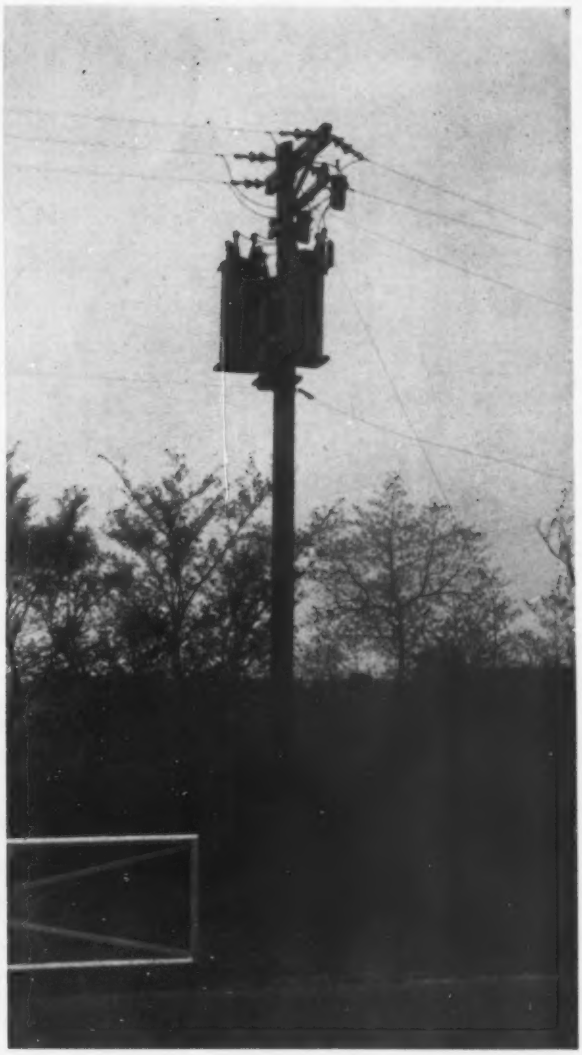
Seven miles of the 7.2/12.47-kv line total distance had been underbuilt with telephone facilities that consisted of five pairs of open wire on crossarms and one "B urban" cable.

All testing of the new TV transmitter had been done after regular sign-off time, mostly between the hours of 1:00 and 5:00 a.m. Since there was very little use of these rural telephone circuits during these hours, there was no knowledge of harmonics from mercury rectifiers being present.

At 6:15 p.m. one night KFVS-TV, with a flip of a switch, transferred their broadcasting from the old transmitter and tower to the complete new setup. The telephone circuits on the underbuilt rural



A 300-kva transformer bank is used for station power.



At the transmitter main switch is a regulator station.

lines were beset with such a noise that communication was almost impossible.

The telephone company informed us of the noise problem and checks were started immediately. Telephone construction or pole transfers on the underbuilt lines were only partially completed and this added to the problem.

The telephone company hastily completed their construction work and our facilities were completely gone over, including all grounds, clearances, and connections. The telephone company removed all open wires from service and bonded them to ground. Our 12-kv line was checked for radio noise and was found to be better than normal.

In checking the type of noise involved it was found to be a group of frequencies, all 60-cycle multiples, with the 19th harmonic being the strongest, closely followed by the 17th. Conventional type telephone filters would not remove the noise. TIF readings were taken across our 120-volt secondary, some distance from the transmitter, and data taken showed it varied from approximately 65 db with the transmitter on to 47 db with it off.

Readings varied

The level of these readings varied from day to day but the pattern was consistent. Connections could not be changed in the rectifier circuits at the TV transmitter so another quick economical method had to be employed.

We had installed a 75-ckva bank of capacitors on the 12-kv line between the TV transmitter and the point where joint construction started, so these were replaced with a 150-ckva bank. When these were energized it reduced the TIF reading from 65 db to 58 db on our 120-volt secondary.

Another set of capacitors was installed on the TV transmitter's 240-volt secondary, which reduced the harmonic component somewhat more. With these reductions the telephone circuit was within operating limits. More reductions could be obtained with the use of a resonant shunt on the transmitter secondary, but the additional cost could not be justified for the reductions which would be obtainable.

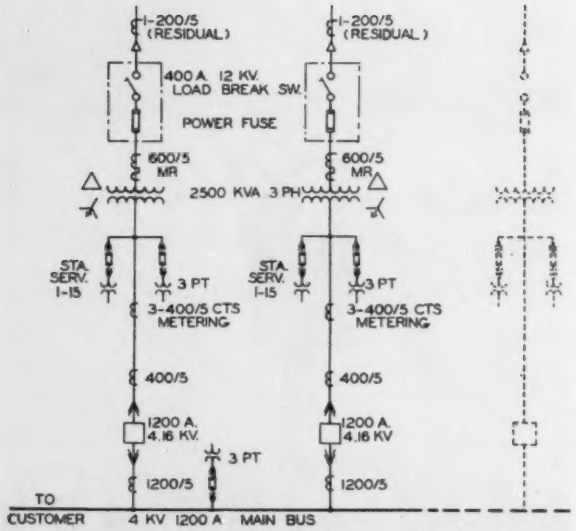


Fig. 1—Shown is electrical layout of customer's vault.

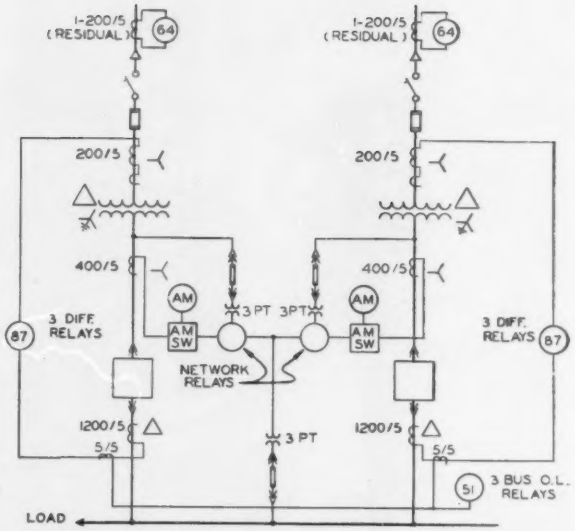


Fig. 2—This relaying one-line shows existing equipment.

Relaying for spot network service

Spot networks, required to furnish higher secondary voltages, have confronted the engineer with new problems of protection

By C. S. Kayser, Distribution Relay and Protection Engineer, Houston Lighting and Power Co.

◆ The trend toward higher voltages is apparent today in all types of service.

Voltages above 138 kv are commonplace for transmission lines; 66 and 33 kv are used for subtransmission and even distribution in some areas; four kv is being replaced by 12 kv as a standard distribution voltage, at least on our system.

At the same time, secondary voltages above 120/240 are becoming more common. Many more appliances are being built to operate at 230-240 volts. Large industrial and commercial motor loads are responsible for the demand for secondary voltages above 240 volts; 4,160 volts is now a standard secondary voltage for certain types of loads above 4,800 kva on our system.

This trend also applies to secondary network voltages. Just about ten years ago network service was offered only at 120/208Y volts. Soon after this we were accepting requests for spot network services, under certain conditions, at 265/460Y volts. Today we have many 265/460Y-volt spot networks on the system, and recently we accepted a request for spot network service at 2,400/4,160Y volts.

This service is to the Baylor College of Medicine in the Houston Medical Center. The old service was from a 265/460Y-volt vault located in the original building. Expansion of the customer's facilities, including the construction of several new buildings, necessitated a change in service location to a new building to be constructed adjoining the old one.

Service for the old building will be taken from the transformer vault in the new building. Plans for future expansion called for several other buildings nearby, all to be served from the one point of service.

The fairly widespread area covered by the customer's facilities, along with the fact that several large air-conditioning motors were to be installed which could be purchased for operation directly at 4,160 volts, made this higher voltage attractive to the customer from an economic standpoint.

The customer's future load is expected to be approximately 6,000 kva. The need for a high degree of service continuity dictated a choice between automatic transfer or network service. The large amount of reserve feeder capacity which must be maintained for an automatic transfer scheme, the fact that the customer is located in an area served by underground 7.2/12.47 feeders where spot networks are already numerous, and the higher degree of reliability made network service both desirable and practical from the company point of view.

Calculations showed that by using larger transformers, 2,500 kva, and only three feeders, the cost to the company for a 4,160-volt network vault would compare favorably with the cost of the 460-volt service using smaller transformers and more feeders.

The Houston Medical Center

area where the Baylor College of Medicine is located is served from our Grant Substation. This substation consists of two 25/33/42-mva transformers operating in parallel on a 12.47-kv bus with solidly grounded neutral. The station feeds both overhead and underground loads. Four of the nine feeders from this station are all underground cable circuits, the remaining five serve mostly overhead loads.

The underground cable circuits serve both spot network and radial loads. The radial loads are equipped for either manual or automatic throw-over. The automatic throw-over schemes use circuit breakers which are provided with both instantaneous and time delay relays for overload protection. The manual schemes use power fuses for overload protection.

Instantaneous first tripping followed by an immediate reclosure and transfer to time delay relays is used on the underground feeders. It is not our practice to close automatically on network feeders, but the presence of radial loads requires at least one time delay trip to coordinate with the customer's overload protection.

High side faults in the customer's equipment will be cleared by the simultaneous tripping of both the substation breaker and the customer's breaker where used; the immediate reclosing produces a minimum of disturbance to other customers on the circuit and prevents automatic throw-over of other customers where this type of equipment is provided. Two of these feeders are used to supply the present 4,160-volt network.

Initial installation

The initial installation at Baylor School of Medicine consists of two 2,500-kva, 12.47-4.16/2.4 transformers, two 12.47-kv grounded wye feeders, and low-voltage switchgear with two 4,160-volt, 150-mva interrupting capacity circuit breakers and associated relaying. Provisions are made for a third 2,500-kva transformer, 12.47-kv feeder, and low side circuit breaker.

The electrical layout of the customer's vault is shown in Figure 1. At the lower network voltages, faults between the transformers and low side breakers are expected to burn clear; at 4,160 volts they will not. The transformers are connected to the feeders through metal-clad power fuse and load-break switch combinations.

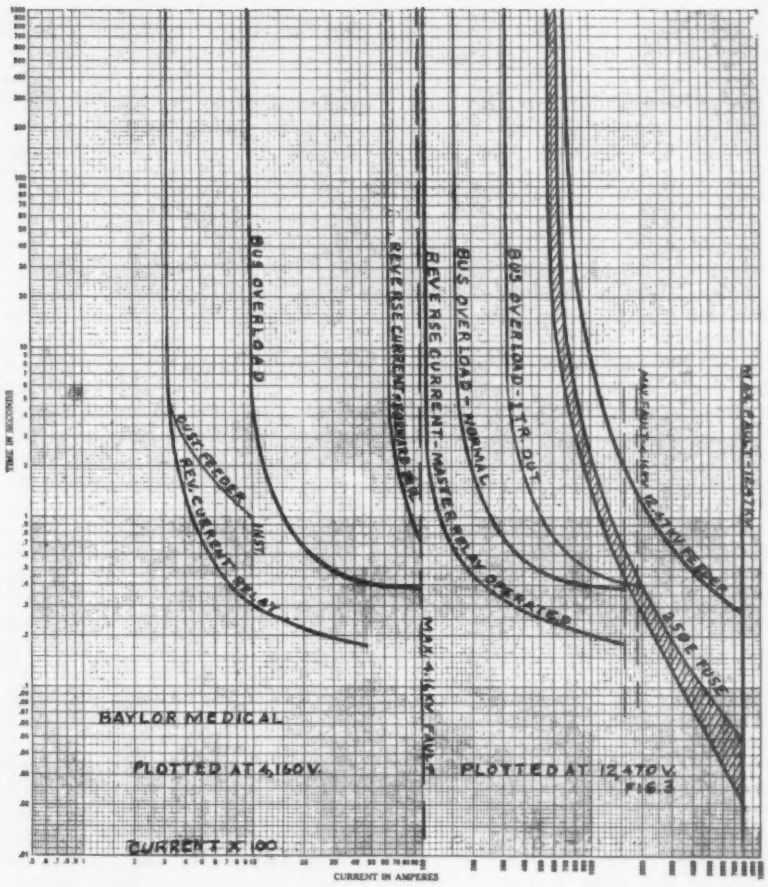


Fig. 3—The chart shows the final coordination of the relays described.

This fuse is expected to clear these faults on the low side, and also possible transformer faults, from the feeder.

Figure 2 is a relaying one-line of the existing equipment. The 400/5 current transformers are for the network relays, the 1,200/5 current transformers are used for both the transformer differential relays and bus overload relays through auxiliary 5/5 current transformers to maintain isolation of the differential loops.

The transformer differential loop is completed by the 200/5 current transformers on the 12.47-kv transformer bushings. The 200/5 current transformers shown on the line side of the fuses are single-current transformers enclosing all three phases. Three sets of potentials are required for the network relays, one on the source side of each breaker and one on the bus so that potential across an open breaker may be measured.

From the location of the current transformers the zones of protection afforded by each type of relay can be determined. The bus overload relays may be considered differentially connected, the 1,200/5 current transformers are paralleled through the auxiliary current transformers so that any current due to a fault external to the bus will not flow in the relays; they see only the total load drawn from the bus.

These relays are set for approximately 6,000 kva or 200 per cent of the anticipated total load before the third transformer is added, and are to protect the bus itself, the run to the customer's switchgear, and the customer's bus.

Sensitive network relaying is required to clear the low side breakers for faults on the grounded wye supply system. The network relaying consists of a master relay and phasing relay. The master relay is a three-phase power relay connected to trip for power flow away from the bus and will trip for faults or outages on the supply system.

This relay is extremely sensitive and will close its tripping contacts on transformer charging current. In this application, the breakers are not tripped directly by the network master relay. The actual tripping is accomplished by either a timing relay or induction disc overcurrent relays equipped with shading coils. The induction disc relays are set to trip at approximately 2,000 kva with the shading coils shorted by the master relay.

These relays trip at approximately 20 times this value with the shading coils open. In this application, the induction disc relays become directional overcurrent relays with the network master relay providing the sense of direction. This relay protects the low-voltage transformer leads and the transformer for heavier faults on the supply cables from current fed through the network.

The master relay also energizes a timing relay which is set to trip the low-voltage breaker in ten seconds. As the master relay must be set to trip on transformer and cable charging current there is a possibility of tripping or surges caused by large motors starting, or secondary faults, in adjacent vaults. The ten-second time delay is necessary to override disturbances of this type.

In addition to the master relay and its associated tripping relays, a phasing relay is required. The master relay will also close the breaker when the source voltage is present. The phasing relay has contacts in series with the master relay closing contacts and will prevent reclosing when the phase relationship between the source voltage and secondary bus voltage is such that power would flow away from the bus.

Differential relays

The differential relays are conventional and will trip the low side breakers for faults between the transformer high side bushing current transformers and the low side current transformers on the bus side of the low-voltage breakers. This provides high speed clearing of the fault from the bus to prevent blowing the high side fuse on the unfaulted transformer. The fault must be cleared from the system by the power fuses on the faulted side.

The leads from the power fuses to the transformer and the transformer bushings are outside the protective zone of the differential relays. Normally we would expect the network relay working through the directional overcurrent relays to trip the breaker for a fault in this zone. We felt that it would be possible for the feeder breaker to open on the instantaneous trip before the low-voltage breaker tripped through the master relay and directional overcurrent relays.

Blown fuse possible

On certain high current line-to-ground faults it would be possible to blow the high side fuse on this operation. The feeder breaker would then close and remain closed as the fault had been removed from the source side by the fuse.

This would result in one transformer bank being connected to ground at one corner of the delta with phase-to-neutral voltages being impressed across two legs of the delta while normal phase-to-phase voltages are impressed across the other bank. This results in a very low value of fault current. Our calculations indicated that the network master relay would probably not operate.

The power drawn by the load and the phase angle of the fault current in one leg of the wye connected secondary would supply enough torque in the closing direction to overcome the tripping torque in the other leg. To assure fast tripping of the low side breaker for a fault in the area between the fuses and bushing current transformers, the single, window type, current transformers were installed to enclose all three phases of the incoming lines where they entered the fuse cabinets.

Care was exercised to keep the cable terminals isolated from ground on the load side of these current transformers, all sheath grounding being done on the source side of these current transformers. An instantaneous overcurrent relay is used with these current transformers to trip the low side breaker.

Should one phase of the power fuse blow for a ground fault in this zone, and the substation breaker trip and close without opening the low side breaker, sufficient current will flow through the primaries of both transformers to ground, through the fault, to trip this relay which is set for 200 amperes primary current. In order for this current to flow, current must circulate through the secondaries and low-voltage bus.

Should another network service of this type be built in the future, we feel that we would install three external current transformers just ahead of the fuses so that these cables would be included in the zone protected by the differential relays. This connection would eliminate the need of the ground relay described above.

The protective scheme must include a lock-out relay. The network relay also incorporates a closing function as described above. Any trip initiated by the bus overload, differential, or ground relays must operate a lock-out relay, which in our case is hand reset, to prevent closing of the circuit breakers. The breakers are allowed to close when conditions are restored to normal if they are tripped by the master relay, due to faults on the supply feeders or opening of the substation breaker.

Little difficulty was experienced in coordinating the various relays described above. Rather low lever settings and short times were dictated by the high speed characteristics of the power fuse used on the 12.47-kv side of the transformers. The settings on the customer's switchgear as recommended by the manufacturer were too long for satisfactory coordination with the overload relays.

Investigation showed that these could be lowered considerably without adversely affecting the customer's operations. All of his feeder relays were equipped with induction overcurrent relays with instantaneous elements.

By setting the instantaneous elements as low as actual conditions would permit, and lowering times as much as practical, adequate coordination could be attained. The customer was requested to make these changes. Figure 3 shows the final coordination.

Our Grant Substation, which supplies this vault, is equipped with supervisory control and alarms. We found that an alarm circuit could be installed in this vault at reasonable cost and carried over a leased telephone line to the Grant Substation. It was decided to do this and tie it in to the supervisory alarm system at the substation.

This alarm is connected to the lock-out relay in the switchgear so that an alarm is given in the power dispatcher's office when a low side breaker is tripped by the overload, transformer differential, or high side ground relays. We felt that no alarm was needed

(Continued on page 134)

New tap changing design can reduce transformer size

◆ A major design advance in Allis-Chalmers load tap changing transformers provides 20 per cent savings in size and weight and reduces losses 15 per cent and more.

The new equipment is available in a complete line especially for application on autotransformers 50,000 kva and larger through the extra-high voltage range. Over 1,300,000 kva are in service, and another million kva are now being built.

Formerly, load tap changing autotransformers required a series transformer to introduce voltage regulation into the line with the tap changing mechanism itself located in a tertiary winding.

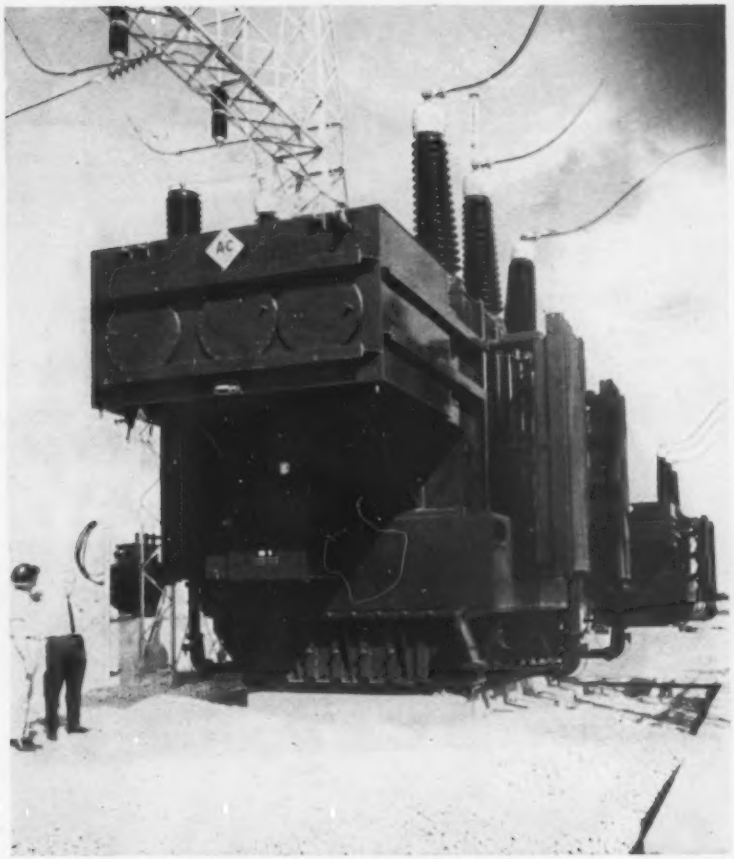
This meant an additional core and coil assembly was required inside the transformer with capacity commonly ten per cent of the transformer rating and an even greater proportion of overall size.

With the Allis-Chalmers unit, the tap changer regulates directly in the line end of the winding and eliminates the need for these series transformers.

Benefits to the utility users include:

(1) Higher rated units can be shipped in one piece, saving assembly time and expense.

(2) Less weight means lower handling and moving costs.



At this installation of two Allis Chalmers autotransformers, each rated 180 mva, 230/138 kva, the new tap changing design reduced losses 85 kw and decreased the weight 50 tons for each unit. Elimination of series transformers for line voltage regulation is big feature.

(3) Smaller foundations are required.

(4) Higher efficiency results from the reduction in losses.

(5) Initial cost is less.

Installation cost is low since the tap changers are shipped completely assembled and installed. Line bushings are standard and replacements are readily available should damage occur. The tap changers are highly reliable, using an advanced design based on 37 years of Allis-Chalmers experience in load tap changing.

Maintenance is simplified because all current interrupting components are easily accessible.

Redesigned power transformers feature greater mobility

◆ Greater mobility, easier station change-outs, and longer service life are among the advantages claimed by General Electric for its redesigned power transformers.

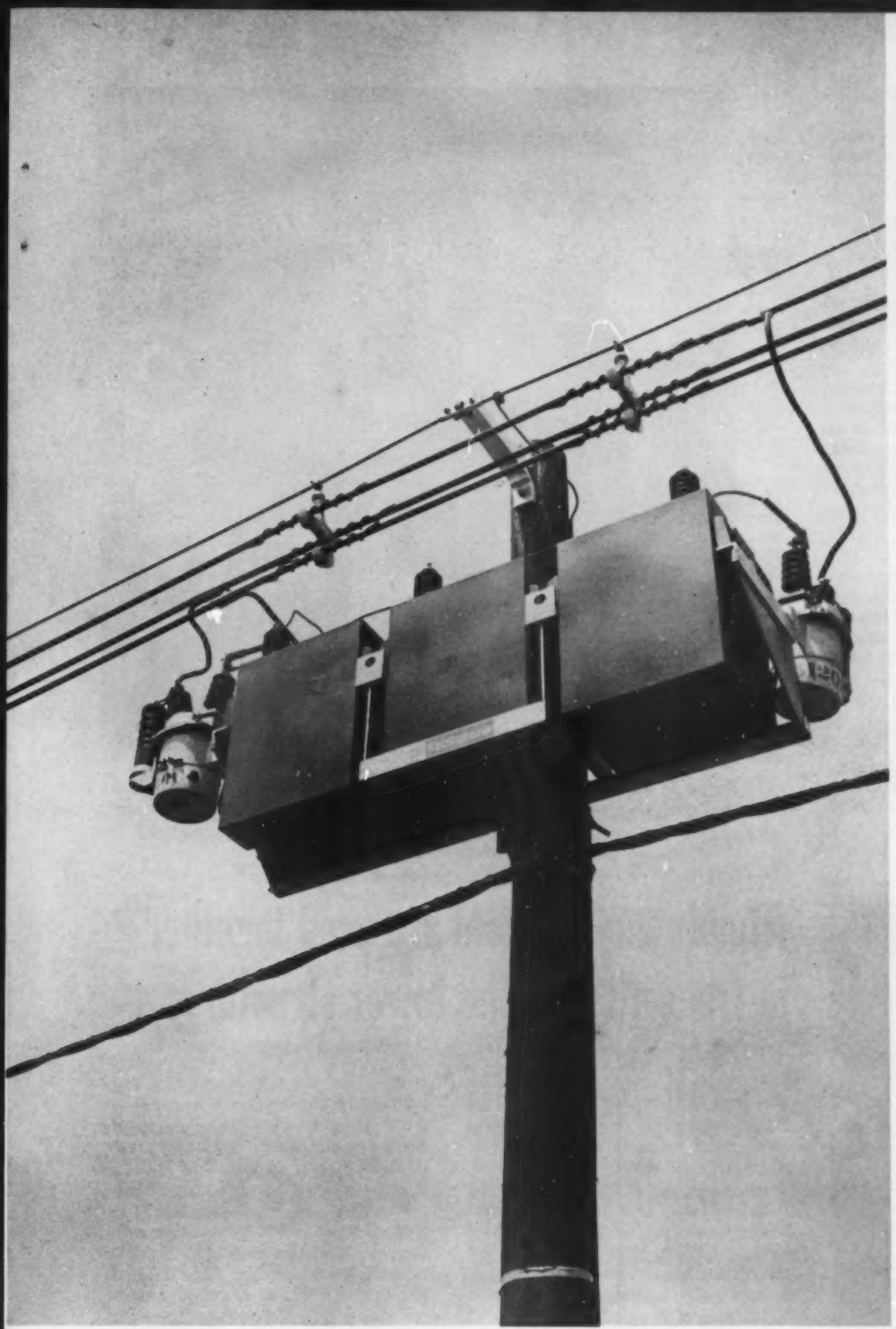
The advantages are the result of product improvements suggested by 32 electric utilities and consulting firms interviewed last year, according to George H. Hupman, G-E power transformer marketing manager. The improvements are centered around "Preferred Design" large substation transformers rated up to 25,000 kva.

Moving is simplified because tank height has been reduced from over 15 feet down to 12 feet and weights have been cut about ten per cent. The lower height means transformers on highway trailers can pass under bridges built to former Federal highway minimum clearances of 14 feet as well as present 16-foot requirements.

Mr. Hupman said the reductions mean the new transformers are easier for utilities to move from railroad sidings to substations and

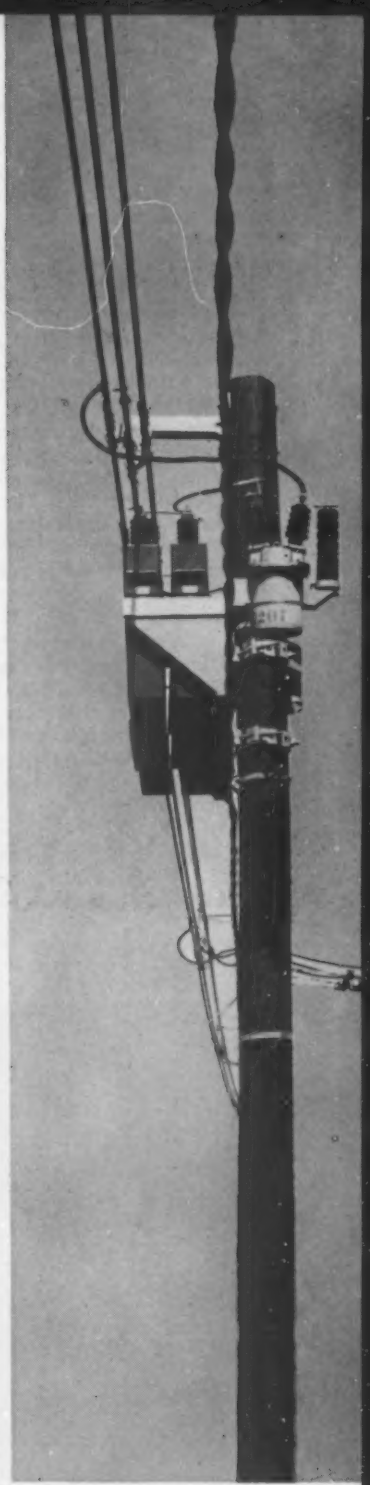
As received.

New Westinghouse Completely Self-Protected Autotrol saves more than $100 in installation costs— eliminates pole top clutter



90-minutes later.

J-65004



Slim silhouette, no pole top clutter.

This test installation on the above 600 KVAR, 13.8 KV Autotrol was made in less than 90-minutes by Public Service Electric and Gas Company; Newark, New Jersey.

This new Westinghouse Completely Self-Protected Autotrol® is delivered as a Complete Single Package. In addition to capacitor units, oil switches and junction box, the new Westinghouse CSP Autotrol has lightning arresters and fuse protection mounted directly on the switches. The cost of installing three arresters and three cutouts is eliminated, also the cost of the cross arm needed to hold them. Therefore, this compact design, which requires less pole space, may mean the difference between using an existing pole and installing a new, taller one. Just hoist up the Autotrol, anchor it to the pole, fasten three leads and it's on the line.

For complete information on this Westinghouse exclusive . . . call your Westinghouse Sales Engineer. Or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. You can be sure . . . if it's Westinghouse.

(trademark)

Westinghouse

to other locations during future change-outs.

Transformer length and width have been reduced by using sealed-tank oil preservation and moving radiators from the end to where they hug the side of the transformers.

The cut in floor space simplifies station change-outs because existing transformers can be replaced with higher-rated units of the new design without requiring extensive substation rebuilding.

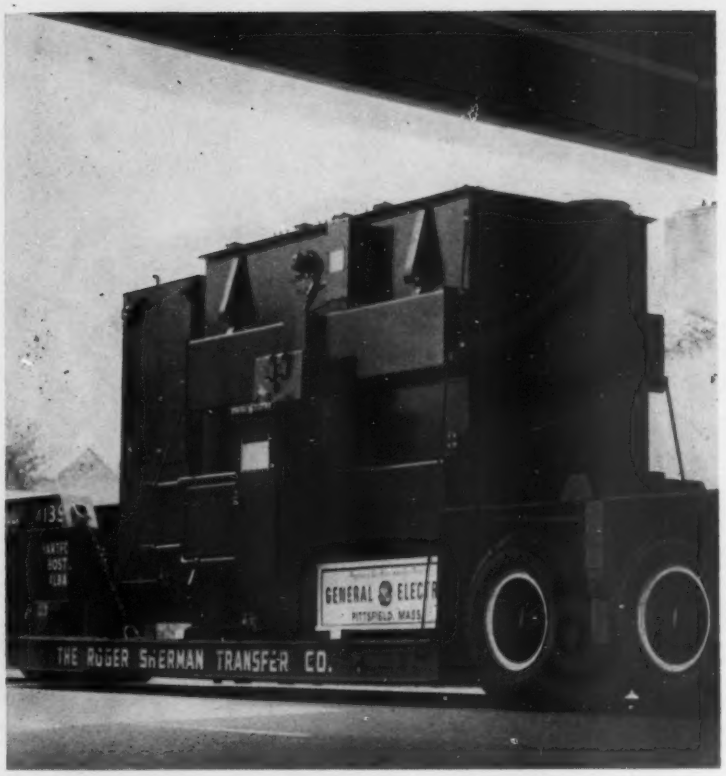
Permalex transformer insulation is a standard feature of these low-height units. When operated at 55 C, these transformers have greater overload capabilities.

The thermally-superior insulation also permits 65 C continuous operation at 12 per cent higher kva capacity with no loss of life.

Mr. Hupman reported Permalex insulation is optional on units rated above 25,000 kva. General Electric believes that operation of these larger transformers at 65 C is less desirable due to higher loss and impedance evaluations. However, the choice here is left to each utility.

In addition to the product improvements, Mr. Hupman says the

(Continued on page 139)



Rated at 25,000 kva, 115 kv, a low-height G-E power transformer clears the overpass with room to spare enroute to a utility substation.

Aluminum cages and crossarms are combined with steel tower bodies.

Aluminum and steel are used together in transmission line tower structures

◆ Union Electric Co., St. Louis, Mo., has constructed a pace-setting transmission line employing towers combining aluminum and steel structural elements.

Running for 13 miles along the Illinois side of the Mississippi River near St. Louis, the double-circuit 138-kv line consists of 40 structures with aluminum tops — cages and crossarms—combined with steel tower bodies.

Aluminum Company of America's Alcoa Structural Division fabricated the aluminum segments of the towers. Aluminum members were designed by Alcoa in cooperation with Stone & Webster Engineering Corp., designers, engineers, and agents for Union Electric.

Predicted maintenance savings over the life of the line led to the unique design of the structures. The 108,000 pounds of aluminum in the line—an average of 2,500 pounds per tower—are expected to more than pay their way in saving costs of painting and de-energizing the line for this task.

Linking the utility's Meramec Power Plant with existing lines in Lemay, Mo., the line is in an area of anticipated future expansion of heavy industry, where atmospheric corrosion will necessitate frequent painting of the steel portion of the towers.

Use of maintenance-free aluminum in the "hot" section of the structures will reduce painting expense.

Recently energized, the line was built by the L. E. Myers Co., Chicago. Aluminum was fabricated at the Alcoa Structural Division facility in Cressona, Pa. Steel was

(Continued on page 134)

New utility equipment

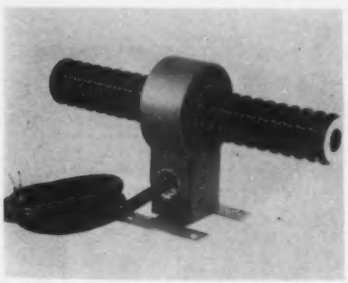
Sangamo current transformer

A new through-type outdoor current transformer is being announced by the Sangamo Electric Co., 11th and Converse Sts., Springfield, Ill.

The type V-150 transformer combines high voltage (15 kv) capabilities with low cost.

Because of its two per cent accuracy characteristics, the transformer is ideally suited for use with system measurement meters and for capacitor switching control instruments. The V-150 is available in 200:5 and 100:5 ratios.

The type V-150 is molded in epoxy and fitted with a porcelain bushing



which will handle conductors up to 15/16 inches in diameter. The transformer is furnished with five feet of type SO 12/2 secondary lead. The secondary outlet is fitted with a one-inch threaded bushing for conduit connections.

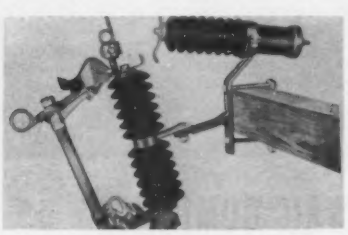
Mounted on a stainless steel base plate, the type V-150 is color coded for quick identification in the field.

Write U-1001 on reply card, p. 19

Arrester-cutout units

Southern States, Inc., Hampton, Ga., has a new line of cutout arrester combinations consisting of an open type distribution cutout mounted in conjunction with an externally gapped, valve type arrester.

Any one of five Southern States cutouts rated 7.8, 15, or 27 kv may be specified as components of these combinations. Cutouts available are the expendable cap BV-33-F or single-vented SV-33-F, the extra heavy-duty BV-33-G, and the BV-33-J or SV-33-J equipped with hooks for use with a load break tool. Arresters rated nine, ten, 12, 15, or 18 kv are available.



The new cutout arrester combinations are supplied for mounting on either crossarms or poles. Each mounting arrangement may be supplied with the arrester mounted vertically or horizontally.

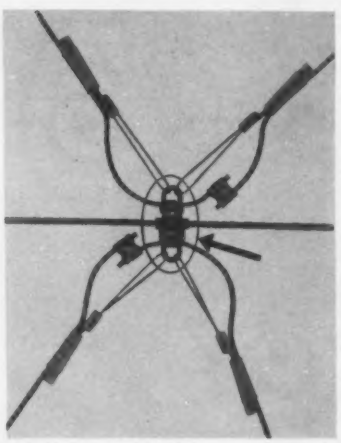
The units are supplied with a two-piece bracket which permits the cutout to be swiveled in either direction as much as 45 degrees. Another design feature worth consideration is the ease with which the arrester can be assembled either to the left or the right of the mounting bracket on all arrangements where the arrester is vertical.

Write U-1002 on reply card, p. 19

Blackburn neutral span clamp

A neutral span clamp developed by Jasper Blackburn Corp., 1525 Woodson Rd., St. Louis 14, Mo., doubles as a parallel groove connector for aerial cable neutral, and as a dead-ending clamp accommodating up to four service drops.

All four taps need not be made at



the time of installation; they may be installed later, independent of existing conditions.

Known as the type MS, the one-piece clamp is cast in high strength aluminum alloy, with galvanized steel hardware.

Write U-1003 on reply card, p. 19

Lapp suspension insulator

A new compact nine-inch suspension insulator with a combined M&E strength rating of 14,000 pounds is

announced by the Lapp Insulator Co., Inc., Le Roy, N. Y.

The new suspension, called "Hi-F" (for high efficiency) combines the cap-head-and-pin design of a standard six-inch dead-end insulator with the shell design of a standard ten-inch suspension. Since both the cap and the shell are one inch smaller in diameter, the new "Hi-F" suspension has the same leakage distance as the standard ten-inch insulator.

Unit spacing is the same so string flashover characteristics of the new "Hi-F" suspension, e.g., wet, dry, and impulse, are the same as existing NEMA standards for 15,000-pound ten-inch suspensions.

The new functional design suspension is recommended for normal duty transmission lines and provides an adequate safety factor for any suspension use on working loads up to 7,000 pounds.

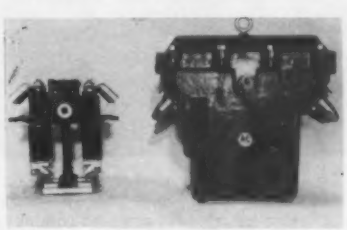
Weighing about one-third less than the standard 10-inch unit, the new suspension is available in both ball-socket and clevis type units for 5¾-inch spacing and ball-socket units for 5-inch spacing. Impact strength rating is 55 inches per pound, identical with NEMA standard 10-inch units. "Hi-F" uses the same ball-socket and clevis-eye details so is physically interchangeable with NEMA standard 15,000 and 25,000 pound suspension insulators.

Write U-1004 on reply card, p. 19

Allis-Chalmers oil switch

Introduction of a new watertight, subway type, three-pole oil switch, M-35, to meet the growing trend toward heavier underground systems and interconnections, and the larger available currents, has been announced by Allis-Chalmers Manufacturing Co., 938 S. 70th St., Milwaukee 1, Wis.

The new five-kv, 300-ampere switch is able to withstand momentary and short time currents to 25,000 amperes. It has porcelain insulators,



Switch & protect residential underground circuits . . . in air

S&C's new pad mounted gear employs fuses and disconnects expressly designed for compact air-filled enclosures

The pad mounted transformer illustrated above features easy access to both primary and secondary connections. The transformer manufacturer has used an S&C pad mounted fused disconnect on the incoming side. The hinge of the primary fuse, visible between the two barriers, mounts directly on the side bushing of the transformer. Flanking the fuse are two disconnects, permitting the transformer to be isolated without disturbing the incoming cable connections.

The simplicity and practicality of overhead distribution practices are now available on residential underground circuits. "Air-filled" S&C pad mounted gear switches, protects and isolates pad mounted transformers and buried cables. It provides all these advantages, too:

1. Full load switching and fault interruption are *outside the transformer.* No arcs are drawn under oil to cause fires, "burping," contamination. External switching also means *visible air gaps.*

2. Fuse eliminates need for primary link inside transformer. Transformers needn't be untanked for re-fusing.

3. Wide choice of fuse ratings (up to 200E amperes continuous) permits close coordination, anticipates load growth.

4. Both transformers and cables can be switched. This applies to load currents, charging currents, and magnetizing currents.

5. Eliminates the hybrid combination of overhead sectionalizing with pad mounted transformers—puts your residential distribution system entirely underground.

You can order S&C pad mounted gear in almost any disconnect and fuse arrangement for sectionalizing . . . or components for transformer primary applications.

The fused disconnect above is S&C's Standard Duty Style; the disconnects are rated 200 amperes continuous (8,000 amperes momentary); the fuse is rated up to 50 amperes continuous, 8,000 amperes interrupting. With Loadbuster, the disconnects and the fuse can switch full load.

S&C ELECTRIC COMPANY

4441 Ravenswood Avenue • Chicago 40, Illinois

Specialists in High Voltage Circuit Interruption since 1911

S&C Heavy Duty Pad Mounted Fused Switching Unit shown above is a complete, free-standing device—functioning, in this case, as loop tap serving adjacent pad mounted transformer. Disconnects are rated 600 amperes continuous (25,000 amperes momentary). Power fuse is rated up to 200 amperes continuous, and 17,500 amperes interrupting.

Note how visible circuitry reduces chance of operator error. With Loadbuster, S&C's portable loadbreak tool, the operator can switch full loads—up to 400 amperes at 14.4 kv.

laminated copper brushes, and stud and contact blocks.

The new nonautomatic subway oil switch, designed for disconnect service on underground distribution systems, is suitable for wall mounting, manholes, and in subways for sectionalizing of lines, switching transformers, and similar services where positive and safe operation is necessary without frequent adjustment and inspection.

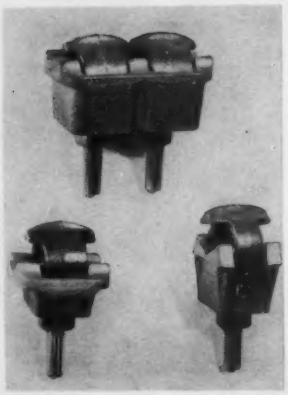
Write U-1005 on reply card, p. 19

Penn-Union tap connectors

The completion of a line of tap connectors for connecting cable to aluminum or copper buses, spades, or contact pads of transformers, switches, or switchgear enclosures has been announced by Penn-Union Electric Corp., 315 State St., Erie, Pa.

Featured on this line of "LS" and "LSN" single tap and "LD" one-way or two-way eyebolt tap connectors is compactness, wide range and for NEMA drilling.

The types "LS" and "LSN" have the additional features that permit the mounting of four connectors on a standard four-hole NEMA drilled pad to accommodate cable sizes up through 1,000 MCM cable. The type "LD" double-basket eyebolt terminal



is designed with ½-inch diameter bolts on 1¾-inch centers which meet two-hole NEMA pad applications.

These connectors cover the full range of cable sizes from No. 10 solid through 2,000 MCM cable and permit clamping up through a ¾-inch thick pad or structural member.

Write U-1006 on reply card, p. 19

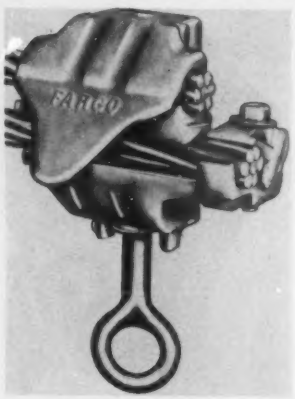
Fargo hot line connectors

Fargo Manufacturing Co., Inc., 845 Main St., Poughkeepsie, N. Y., is introducing a line of massive hot line connectors.

Known as the HN series, they have been designed to meet the demand for a hot line connector with sufficient current carrying capacity for main line connections and the fault currents associated with these applications.

The massive HN series features extra-long contact areas, additional conductor encirclement, and a soft, pure aluminum spacer bar to minimize conductor "cold flow" and assure a low-resistance connection. Also featured are one-man installation combined with the secure attachment of the tap, large ears or lugs for a positive grip in all makes of hot sticks, and a broad hook to make the initial contact easily and remain in position without twisting during installation.

Completely enclosed greased threads are easily loosened after



long exposure. Additional corrosion protection is provided by an inhibitor protective coating on the clamp.

Write U-1007 on reply card, p. 19

P&K lamp lowering device

Production of a new luminaire lowering mechanism that permits ground level maintenance on street lights, area lights, and floodlights has begun at Pfaff and Kendall, 84 Foundry St., Newark 5, N. J.

The new U. L.-listed device is

7 HP Model C4 ..... Powerfully Rugged
DITCH WITCH TRENCHER
LOW-COST TRENCHER!

"If you have enough trench to dig to justify the purchase of any machine, you have TOO MUCH for anything less than a C4"

Compare the Compacts, SEE WHAT WE MEAN!

POWER . . . 7 horses! That's what it takes to dig hard clay, shale, rocky soil . . . Ditch Witch has it!

SELF-PROPELLED . . . Ditch Witch moves itself—no pulling, dragging, winching! Who can top it?

PERFORMANCE . . . C4 Ditch Witch digs 3", 4", or 6" wide, depths to 2', at digging speeds up to 6 FPM!

HEAVY-DUTY long-life construction of Ditch Witch makes it dig better, last up to 1/2 million feet.

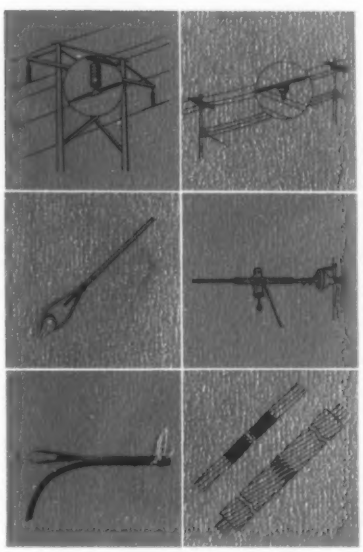
ECONOMY Ditch Witch costs less to buy, operate and maintain than any other *practical* trencher.

Other Ditch Witch trenchers, in sizes from 9 to 30 HP, dig up to 16" wide and as deep as 6'.

COMPARE! See each machine dig in field demonstration before you buy. To get a free Ditch Witch demonstration, call the nearest Ditch Witch distributor—or the factory *collect*. We'll be there!

CHARLES Machine Works, Inc.
CALL COLLECT: FE 6-4404
633 BIRCH ST. • PERRY, OKLA.

FANNER Superformed* PRODUCTS



ARMOR RODS
. . . Protect long spans at supports

FANNGRIPS
. . . For dead-ending strands or conductors

LASHING RODS
. . . For lashing covered conductors to messenger strand

LINEGUARDS
. . . Protect short spans at supports

TAP ARMOR
. . . Protects conductor at tapping points

FANNSPLICES ARMOR SPLICES
. . . For joining, splicing or restoring conductors or strands

All available for all conductor types, metals and sizes

SUPERFORMING IS A MANUFACTURING PROCESS USING EQUIPMENT RESEARCHED • DEVELOPED • PATENTED • MANUFACTURED ONLY BY:

WORLD'S FIRST MAKER OF MACHINE-FORMED ARMOR RODS... **FANNER**

*A superior forming method in accordance with Patents No. 2,769,478 and/or 2,588,663—other patents applied for.

All lines need... **PROTECTION**

Over the years . . . in test after test, on job after job, FANNER SUPERFORMED PRODUCTS have demonstrated superiority as T&D-line holding-protecting devices . . . and for numerous other uses, such as dead-ending, tapping, lashing, splicing and patching.

Why? The *exclusive Fanner Superforming* method. EXCLUSIVE and *patented*. Superforming assures uniformly high quality, lasting dimensional accuracy, unmatched strength. No other forming process can equal it for performance results. Your FANNER MAN will tell you why.

PROTECT *your long spans at these vulnerable points*

...*with* FANNER Superformed* ARMOR RODS

- Bolster conductor strength
- Multiply conductor life
- Provide enduring protection against damage from:

Vibration • Flexure • Flashover • Chafing • Clamping

The *only* holding-protecting devices that provide *all* these advantages

NO CONCENTRATED STRESS . . . uniform all-metal support, no "rubbery" spots

NO PERFORMANCE VARIATIONS . . . applications always uniform

NO FLAWS . . . rod components have smooth surfaces, uniform internal structure

NO CORONA INDUCEMENT . . . rod ends smoothly machined

NO LOOSENING . . . wear, aging, creeping or slipping

NO RE-SAGGING PROBLEM . . . adjustment possible after application

NO TOOLS . . . easy, fast application by hand

*A superior forming method in accordance with Patents No. 2,769,478 and/or 2,588,663—other patents applied for.

THE FANNER MANUFACTURING COMPANY
Brookside Park • Cleveland 9, Ohio

DIVISION OF TEXTRON, INC.

Fine Fanner Superformed Products

A-5383A

available on a wide range of aluminum lighting standards, single- and twin-arm models with truss arms up to 15 feet long. This device can be used to support pendant type incandescent or mercury vapor luminaires and bail or yoke suspended single or twin floodlights.

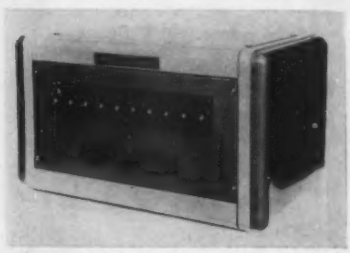
The unit has been found ideally suited for locations inaccessible to the usual maintenance equipment or where such equipment is not on hand. With this device, ground level relamping or luminaire service becomes convenient and economical.

Write U-1008 on reply card, p. 19

Westinghouse remote control

A simplified supervisory system, called Unicode, that handles the control and indication of a single device at a remote station is now available from the Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.

At each remote station Unicode will close and trip one device such



as a circuit breaker or motor contactor, while at the master station continuously indicating with a lamp whether the device is open or closed and sounding an alarm when the position changes. Up to ten remote stations can be controlled from a single master station unit over one pair of telephone type line wires.

The system is intended for application where the master station and all remote stations are located within a relatively small area so that the loop resistance of the line wire channel is low. It is suitable for systems requiring remote centralized control, such as water-well fields, industrial power distribution, or motor control.

Write U-1009 on reply card, p. 19

Edsco meter socket

A new 200-ampere meter socket with an all-steel base-plate, in which high grade porcelain ceramics are enclosed in steel, is being produced by Edsco Manufacturing Co., Inc., 801 W. 8th St., Vancouver, Wash.

Construction of the new meter base eliminates the problems of porcelain breakage and of the shifting of live electrical parts which is common to socket bases molded from plastics.

Aircraft type stainless steel auxiliary pressure springs give additional pressure on the contact blades of

A Westinghouse V-2 Disconnecting Switch advantage to you:

Teflon-coated bushings on live-side loaded bearings are almost frictionless, resist corrosion, never need lubrication, assure long life and less maintenance

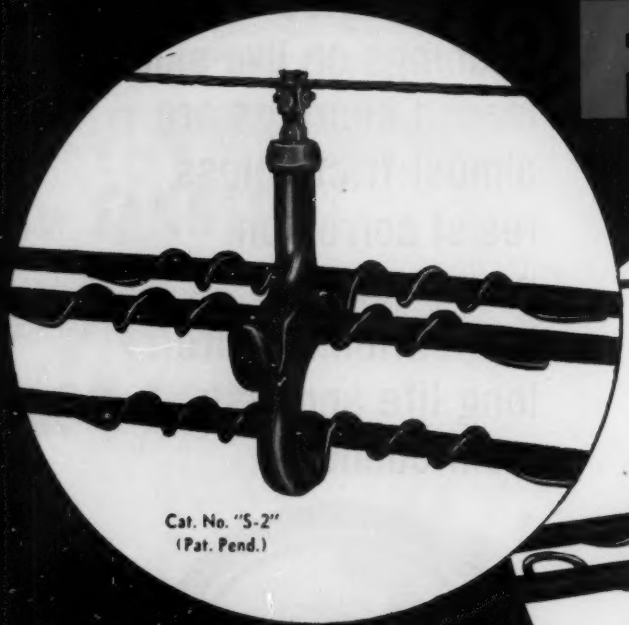
For complete facts on V-2 disconnecting switches, contact your Westinghouse representative or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

You can be sure . . . if it's **Westinghouse**

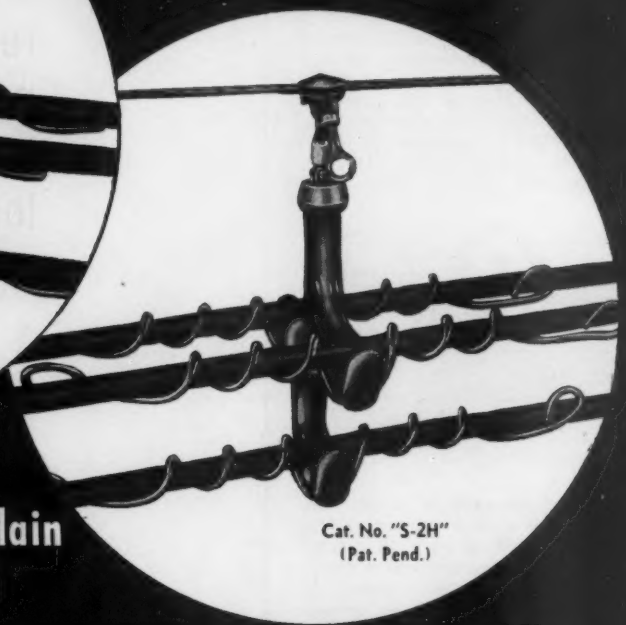
J-61016

For more details on above items, use reply card on page 19

Another FARGO FIRST



Cat. No. "S-2"
(Pat. Pend.)



Cat. No. "S-2H"
(Pat. Pend.)

"S-2" SPACERS
. . . dependability of porcelain
. . . ease of installation

1. **FIRST** with wet process porcelain's proven weather resistance, long term dielectric strength, and self-cleaning for lifetime dependability.
2. **FIRST** with a spacer that can easily be installed with "hot sticks" without service interruptions.
3. **FIRST** with specially designed swivel action hardware which is ideal for grade and corner construction and, also, relieves stress on the spacer.
4. **FIRST** with high gripping power non-conductive tie wires to eliminate mechanical and electrical stress on the cable covering.
5. **FIRST** with a spacer that does not require special grommets to handle or stock for each size cable.

1. **PLUS**, just one unit with 6" on center spacing for 5 or 15 KV for cables from ¼" to 1½" diameter.
2. **PLUS**, wet and dry flashovers and RIV levels compatible with 15 KV systems.
3. **PLUS**, mechanical strength to support loads in excess of 2500 pounds and withstand the forces of faults well over 10,000 amperes.
4. **PLUS**, BIL values in excess of the published standard for 15 KV equipment, even with punctured cable.
5. **PLUS**, diamond configuration of the conductors for safe, easy access to each phase.

Ask your Line Material Field Engineer for complete details.

Distributed by
LINE MATERIAL INDUSTRIES
McGraw-Edison Company
Milwaukee, Wisconsin
In Canada, CLM INDUSTRIES, Toronto 13, Canada

Manufactured by
FARGO MFG. COMPANY, INC.
Poughkeepsie
New York

FARGO

watthour meters to eliminate heating from sustained high-ampere loads at those points. Designated series E 200-4, the new unit also features lay-in type cable connecters which facilitate installation of cables up to 250 MCM.

The unique design of the rugged pipe hub installed on top of the rain tight enclosure keeps the holding screws inside the unit to prevent their corroding or "freezing" to the enclosure cover.

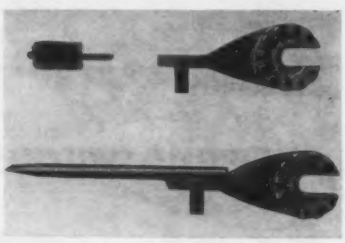
Several types of the new socket are available for surface, flush, or semiflush mounting, in addition to the present line of 100-ampere sockets.

Write U-1010 on reply card, p. 19

Erie insulator brush

A low-cost, easily installed brush which eliminates arcing in Johnson dead-end insulators has been perfected by Erie Fan and Blower Co., Inc., 7 Birdsall St., Buffalo 2, N. Y.

The device developed to correct arcing is a small brush having phosphor bronze bristles and a brass wire core. Inserted in the J. D. insulator joint, the bristles of the brush pierce the corrosion and make an electrical bond between the metal parts.



Springing action of the bristles is sufficient to maintain a tight bond and to hold the brush in position indefinitely.

A special inserting tool, designed to fit the attachment end of a standard hot stick, makes it easy for one man to handle most jobs. Also available is a special spreading tool which can be used to facilitate the insertion of brushes in tight joints.

As a preventive measure, the bonding brushes are recommended for installation on new lines, especially if any line slack is involved.

Write U-1011 on reply card, p. 19

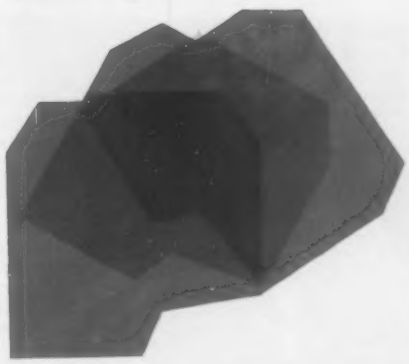
Resin pressure method

A modification of the nozzle used in the Scotchcast brand resin pressure method has simplified use of the method for making high-voltage splices and terminations, it was announced by Minnesota Mining and Manufacturing Co., 900 Bush Ave., St. Paul 6, Minn.

Called the P-5 nozzle, it increases speed in loading the pressure gun and makes the injection of resin

A Westinghouse Metal-Clad Switchgear advantage to you:

Hinged arc chute simplifies inspection and maintenance of DH breaker



For complete facts on Westinghouse metal-clad switchgear using DH magnetic air circuit breakers, contact your Westinghouse representative or write to Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.
You can be sure . . . if it's **Westinghouse**

J-61017

Build lines to stay with CHANCE ANCHORS

there's one for every need

8-WAY EXPANDING ANCHOR
Slips down a hole no bigger than the base plate. 8 rib reinforced blades expand into solid earth all the way around.

NO-WRENCH SCREW ANCHOR
Pitch-controlled blade goes down fast and adds to holding power. Can be installed by hand.

POWER INSTALLED SCREW ANCHOR
Lets you mechanize screw anchor installation with your power hole-digging equipment. Anchors install in 6 to 8 man minutes.

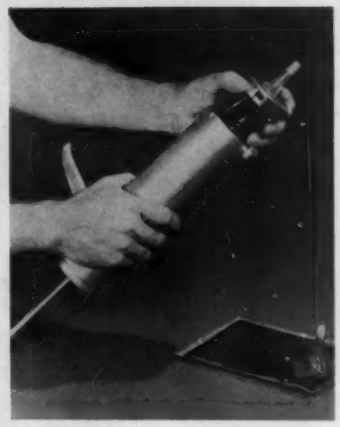
NEVER-CREEP ANCHOR
Pulls entirely against solid, undisturbed earth. Holds more load than any other type of anchor.

CROSS-PLATE ANCHOR
Install in vertical machine bored holes. Costs much less than "dead-man"--holds more.

ROCK & CONE ANCHORS
Wedge into solid rock and wedge against tamped rock.

CAG1-8

A. B. CHANCE CO.
CENTRALIA, MISSOURI
A. B. Chance Company of Canada, Ltd., Toronto



simpler and easier. The new fitting is designed for use with the Unipak resin bag and the Scotchcast brand resin pressure gun. Built-up ports at the base of the new nozzle prevent folds in the plastic Unipak bag from blocking the flow of resin, eliminating internal leakage.

The new nozzle fits all Scotchcast brand model E-4, series A, resin pressure guns. The only modification required for the standard E-4 gun is replacement of the end cap with the new No. 10862 cap assembly. Replacement end caps for the standard E-4 guns are provided at no cost through 3M Electrical Products Division salesmen.

Write U-1012 on reply card, p. 19

L-M smaller size capacitors

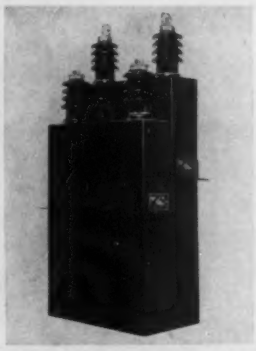
New 50-kvar capacitors featuring a significant reduction in weight from 91 to 70 pounds are available from Line Material Industries, 700 W. Michigan St., Milwaukee 1, Wis.

Tank dimensions are four by 13½ by 20½ inches high. These units, rated 2.4 to 14.4 kv, are among the smallest in size and lightest in weight in the industry.

Important features of the new capacitors are liquid circulation for coolest internal operating temperature and improved pack design.

L-M's concentrated research and development program, which produced the greatly improved 50-kvar capacitor, also will provide a 30 percent reduction in weight of the 100-kvar unit. As a result of customer preference, 100-kvar capacitors will retain the 15-5/8-inch mounting dimensions.

Write U-1013 on reply card, p. 19

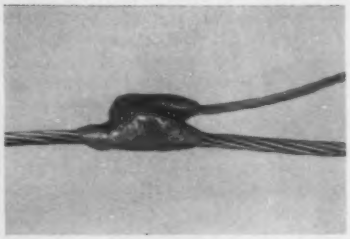


Chance connector covering

A Mylar-backed mastic compound for use in covering electrical connectors has been developed by A. B. Chance Co., 210 N. Allen St., Centralia, Mo.

The pads protect the connection from erosion, dirt accumulation, and chemical attack. They will also extend inhibitor life and effectively prevent connection external deterioration.

The mastic compound is weather-resistant and does not become brittle or flow within a temperature range of -50 F to 250 F. The Mylar pro-



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about TIME SWITCHES?

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***specify* PARAGON!**

See your authorized PARAGON distributor. He carries a complete stock of PARAGON Time Controls, and is able to offer you technical assistance on any application problem. Call now and find out!

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AMF | **PARAGON ELECTRIC CO., INC.**
Subsidiary of American Machine & Foundry Company
1618 TWELFTH STREET • TWO RIVERS, WISCONSIN

vides an added safeguard against puncture during installation, and provides an electrical insulation level of 1,000 volts per mil.

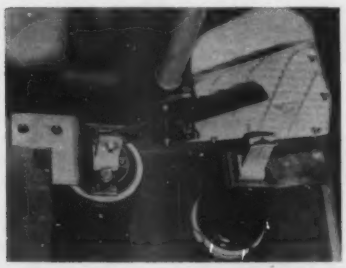
Write U-1014 on reply card, p. 19

Westinghouse break switches

Two load-break switches (air break and oil break) for integral assembly with pad-mounted distribution transformers have been announced by the Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.

Either switch can be used as a load-break switch for removing a transformer from the line or as a sectionalizing switch to remove a high-voltage feeder from service for maintenance.

The unique air switch normally passes load current through the main contacts and the disconnect blade.



However, in parallel with these contacts is a second set of contacts and a quick-break blade located in a plastic arc chute made of Dupont Delrin.

To break load the lineman pulls the disconnect blade open in the usual manner. As the disconnect blade opens, load current is diverted through the quick-break blade. After the disconnect blade is open far enough to prevent restrike, the spring-loaded quick-break blade snaps open and the arc is extinguished in the arc chute.

The oil switch is assembled as a high-voltage porcelain insulator that serves as one entrance bushing as well as the switch support. Spring-driven contacts for load-break are on the insulator, under oil.

Both switches can be used on systems up to 14.4 kv, and have a basic impulse level of 95 kv. They have a continuous current rating of 200 amperes, and a momentary rating of 10,000 amperes asymmetrical. Maximum load break rating at 14.4 kv is 200 amperes.

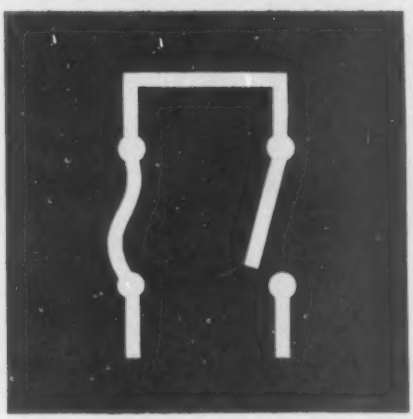
Write U-1015 on reply card, p. 19

Moloney compact switchgear

Air magnetic five- and 15-kv metal-clad switchgear has been recently introduced to the market by Moloney Electric Co., 5390 Bircher Blvd., St. Louis 20, Mo.

Requiring a smaller than usual space, the typical five-kv indoor unit

A Westinghouse Switchgear advantage to you:
DFS drawout switch and fuse switchgear is design-proved in Westinghouse high power laboratory to assure maximum service reliability



For complete facts on DFS drawout switch and fuse switchgear, contact your Westinghouse representative or write to Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.
You can be sure . . . if it's **Westinghouse**
J-61018

Watthour meters are designed to do their job indefinitely. But occasionally repair may be required . . . a truck grazes the meter . . . a rock breaks the cover and dents the register . . . the meter is dropped, the disk bent. Whatever the cause, Sangamo sectionalized construction enables quick, easy, inexpensive repair.

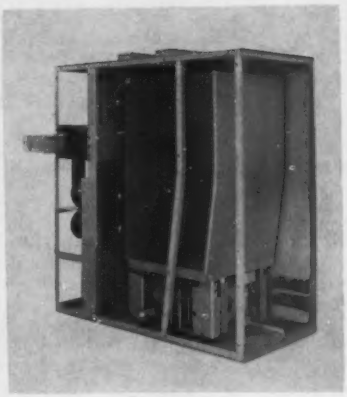
Any major J3 component can be inspected or repaired without completely disassembling the meter or returning it to the manufacturer. There is no paper work delay; the meter is back in service quickly . . . reducing meter stocks.

Parts inventory? Kept to a minimum: all major J3 components (except frame and moving system) are interchangeable with the J2. You can even install J3 magnetic flotation on J2 meters. The economies of sectionalized construction are realized immediately when you standardize on the J3 . . . unsurpassed in metering values.

true MAGNETIC flotation J3

SANGAMO ELECTRIC COMPANY
SPRINGFIELD
ILLINOIS

PW61-9



is 26 inches wide, 58 inches deep, and 63 inches high; while a typical 15-kv indoor unit is 36 inches wide, 85 inches deep, and 75 inches high.

Longer contact life is gained by means of increased contact pressure, which is obtained by unique "blow-on" forces on both the main and arcing contacts. The "blow-on" is obtained on the arcing contacts from the geometry of design. The "blow-on" on the main contacts is derived by means of a slotted block between the primary conductor and stationary contacts, which directs current flow in a loop, creating an electromagnetic effect increasing main contact pressure.

Innercooling results from use of hollow primary conductors with an orifice cut in the top which allows a continuous circulation of air for best cooling of main current carrying components.

Compound, face wound blow-out coils assure best arc interruption over the full current range.

Write U-1016 on reply card, p. 19

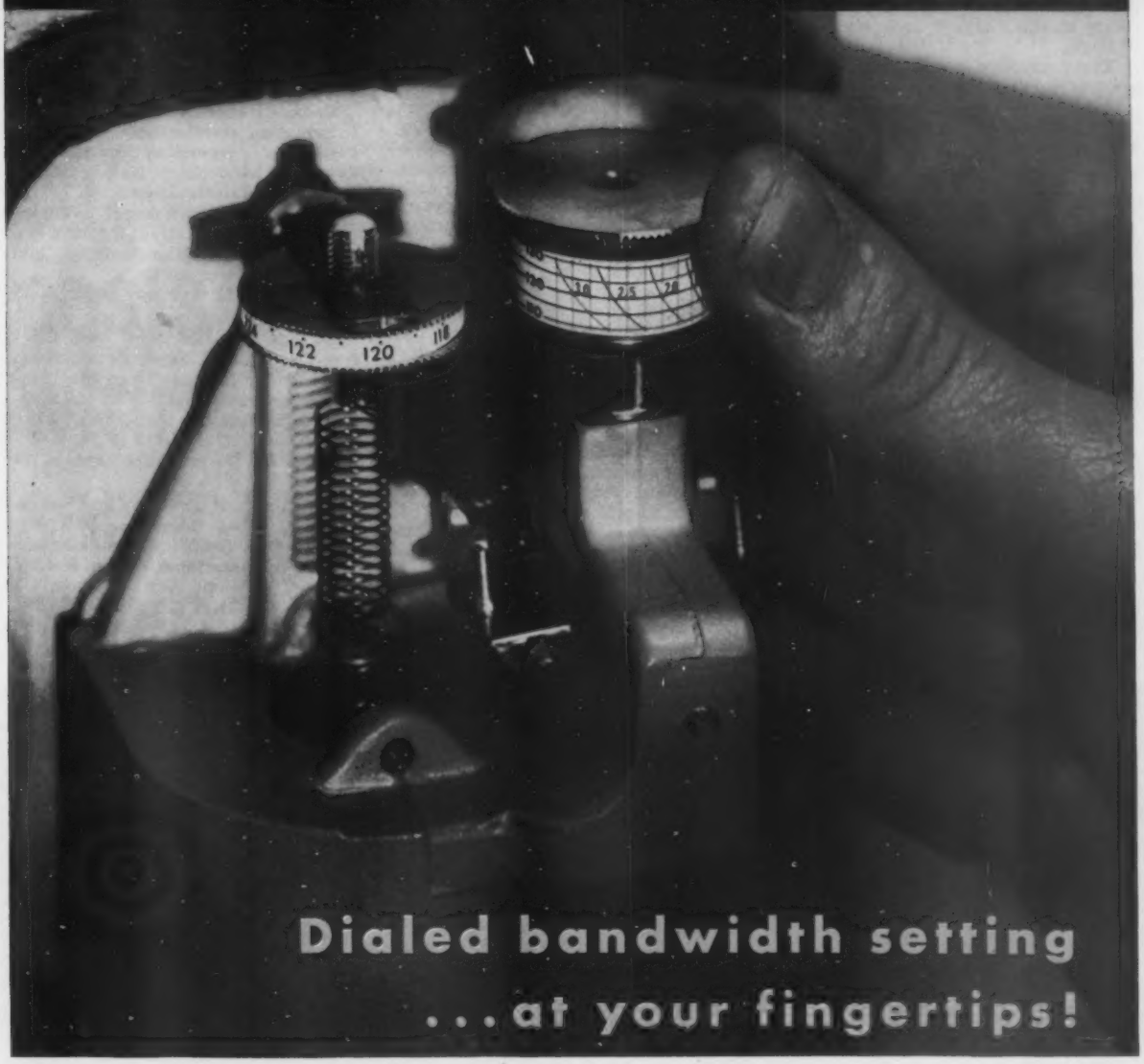
Anderson connectors

A new line of corona-free connectors and bus supports has been recently introduced by Anderson Electric Corp., Leeds, Ala.

The new line is designed to meet increasing high voltage requirements in substations.

Sharp radii, exposed hardware, and other sources of corona loss and radio interference are eliminated in the design, which provides smooth

ANOTHER STEP AHEAD IN VOLTAGE REGULATION



Dialed bandwidth setting ...at your fingertips!

G-E Micro-Band* relay: first to permit fast, accurate setting of both regulator voltage level and bandwidth

Now, with General Electric single- and three-phase step voltage regulators, you can dial optimum voltage level *and* bandwidth *in seconds . . . with micrometer accuracy!*

This important new advantage results from G.E.'s Micro-Band voltage-regulating relay—the first in the industry to offer you a dialed calibration of *both* these vital adjustments.

Micro-Band relay saves you time and money by eliminating the guesswork and painstaking procedures normally involved in making regulator adjustments. What's more, this *full* calibration permits precise coordination of voltage level and bandwidth setting with General Electric's highly flexible time-delay control. Thus, you take full advantage of the reduced bandwidths possible with General Electric regulators—bandwidths proven by recent computer studies to offer you increased system earnings at no sacrifice of regulator life.

Your General Electric regulator representative has complete information on the new Micro-Band relay and can show you how to achieve system savings through reduced regulator bandwidths. Call him today. Or write General Electric Company, Section 456-08, Schenectady 5, N. Y. *Voltage Regulator Products Section, Pittsfield, Mass.*

* Trade-mark of General Electric Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more details on above items, use reply card on page 19

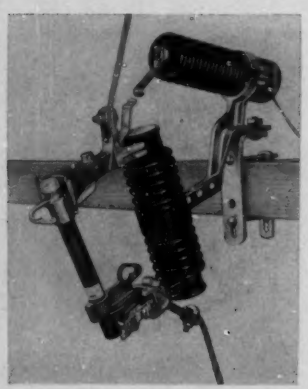
flowing radii and large surface area. Bolts, nuts, and threads are recessed and the finish is free of imperfections, marking letters, and other protrusions.

Tests performed show that this new type connector and bus support can be operated corona free on 345-kv11 systems with less than 50 microvolts radio interference voltage.

Write U-1017 on reply card, p. 19

Kearney arrester-cutout

A new line of valve arrester-cutout combinations has recently been released by the James R. Kearney Corp., 4236 Clayton Ave., St. Louis 10, Mo.



The new line features Unigap valve arresters in combination with Kearney GX, HX, and Trip-O-Link cutouts in 7.8- and 15-kv ratings. Arrester ratings include three, six, nine, ten, 12, and 15 kv.

Units are available on a choice of crossarm, pole, or transformer mounting brackets, plus a T-bracket for side-by-side mounting of arrester and cutout. All mounting brackets have been designed to allow the entire unit to be pivoted horizontally and positioned at any desired angle to the crossarm for maximum convenience of cutout re-fusing or servicing.

These combination units offer decided advantages over individual, separately mounted units. They can be more quickly and easily installed, require less space on the crossarm, and assure permanence of preset gap electrode spacing.

Units are shipped factory preassembled to afford greater ease of handling and storing and an economy of hardware necessary for installation.

Write U-1018 on reply card, p. 19

Street Light Control Shrugs off Killing Transient Voltages

How can a compact, lightweight photo control withstand the control-killing effect of a wide range of transient voltages?

Use Varistors to absorb surges which are below the spark-over of lightning arresters. Let the lightning arrester handle the higher transients.

That's the story on simple, reliable, surge tested LUMATROL MARK I*

Write for Bulletin 91a.

LUMATROL MARK I

**Lumatrol Mark II, for 230 Volt circuits, is described in Bulletin 92.*

MICRO BALANCING, INC.
GARDEN CITY PARK, N.Y.
In Canada: J. R. KEARNEY CORP.
Box 270, Guelph, Ont.

Helpful literature

A practical engineering approach to **estimating distribution transformer loads** from energy consumption is the subject of the third issue of *Concentration*, a quarterly publication available from Advertising Dept., **R T & E Corp.**, 1900 E. North St., Waukesha, Wis. The article and accompanying charts and equations are drawn from a presentation made earlier by Chester F. Mitchell to the Northwest Electric Light and Power Association spring conference at Portland, Oreg. Mr. Mitchell, well-known for his distribution engineering work for Commonwealth Edison Co., Chicago, is presently engineering consultant for R T & E.

Write B-1019 on reply card, p. 19

New data on **conductors**, core wires, cable reels, and conductor lengths has been incorporated into a revision of "Aluminum Electrical Conductors, Stranded-Bare," available from Rome Cable Div., **Aluminum Company of America**, 1501 Alcoa Bldg., Pittsburgh 19, Pa. The revision includes information on 5005 aluminum alloy conductors, aluminized steel core wire for aluminum conductor, steel reinforced, and details on a new size of expanded ACSR—2,294 MCM, 2.32-inch diameter.

Write B-1020 on reply card, p. 19

Two supplements from **Utilities Safety Supply Co., Inc.**, Lee's Summit, Mo., show a complete line of web belts for structural and all-purpose maintenance workers and linemen and industrial work clothing. Supplement No. 21 and No. 22 are both additions to the general catalog of Stringer **lineman's equipment.**

Write B-1021 on reply card, p. 19

Complete specifications and catalog information on the new type PGH high-speed **grounding switch** are available in bulletin No. PPSE-110 from **Line Material Industries**, 700 W. Michigan St., Milwaukee 1, Wis. Included are application information, design and operating features, and accessory information.

Write B-1022 on reply card, p. 19

Bulletin No. 745, from **S&C Electric Co.**, 4435 N. Ravenswood Ave., Chicago 40, Ill., describes the company's new **potential device for monotoring voltages** in the 23- to 161-kv ranges.

Write B-1023 on reply card, p. 19

A complete engineering application analysis, titled **"High-Voltage Testing:** It Can Be Non-destructive" is offered by **Associated Research, Inc.**, 3777 W. Belmont Ave., Chicago 18, Ill. This bulletin, 5-15.4, details the causes of insulation breakdown, the minimizing of destructiveness by current limiting, and many other pertinent aspects of insulation testing.

Write B-1024 on reply card, p. 19

Minimum standards for large switches equipped with high interrupting capacity current limiting fuses for service entrance application are detailed both graphically and in tabular form in a bulletin from **Pringle Electrical Manufacturing Co.**, 1900-1912 N. 6th St., Philadelphia 22, Pa. These standards were developed by Pringle to satisfy a need in the industry as a whole, and are certified by the Electrical Testing Laboratories.

Write B-1025 on reply card, p. 19

Technical bulletin No. 7, covering the new Subalox Anodine **metallic finishes**, is available from **Subox, Inc.**, Fairmont Plant, Hackensack, N. J. The four metallic colors shown all resemble the appearance of anodized aluminum as used in modern architecture and for color styling power plants, tanks, substations, etc. The bulletin covers metal paints which are self-priming in that a base of suboxide of lead provides good rust inhibition.

Write B-1026 on reply card, p. 19

New Autopass **metering equipment** from **Sangamo Electric Co.**, 11th and Converse Sts., Springfield, Ill., is described and illustrated in the recently published bulletin No. 236 from that company. Detailed diagrams cover testing and adjustments, internal meter wiring, and convenient terminal block connections.

Write B-1027 on reply card, p. 19

cut costs with service-proved GC breakers

When the new Westinghouse GC Single Tank Three Phase Power Circuit Breakers (rated 14.4 kv; 100, 250 and 500 mva) were first introduced, tests indicated that they would provide greater protection and require less maintenance and installation cost than the superceded type G breakers. Actual service records now verify these predictions.

Three key features make this performance possible.

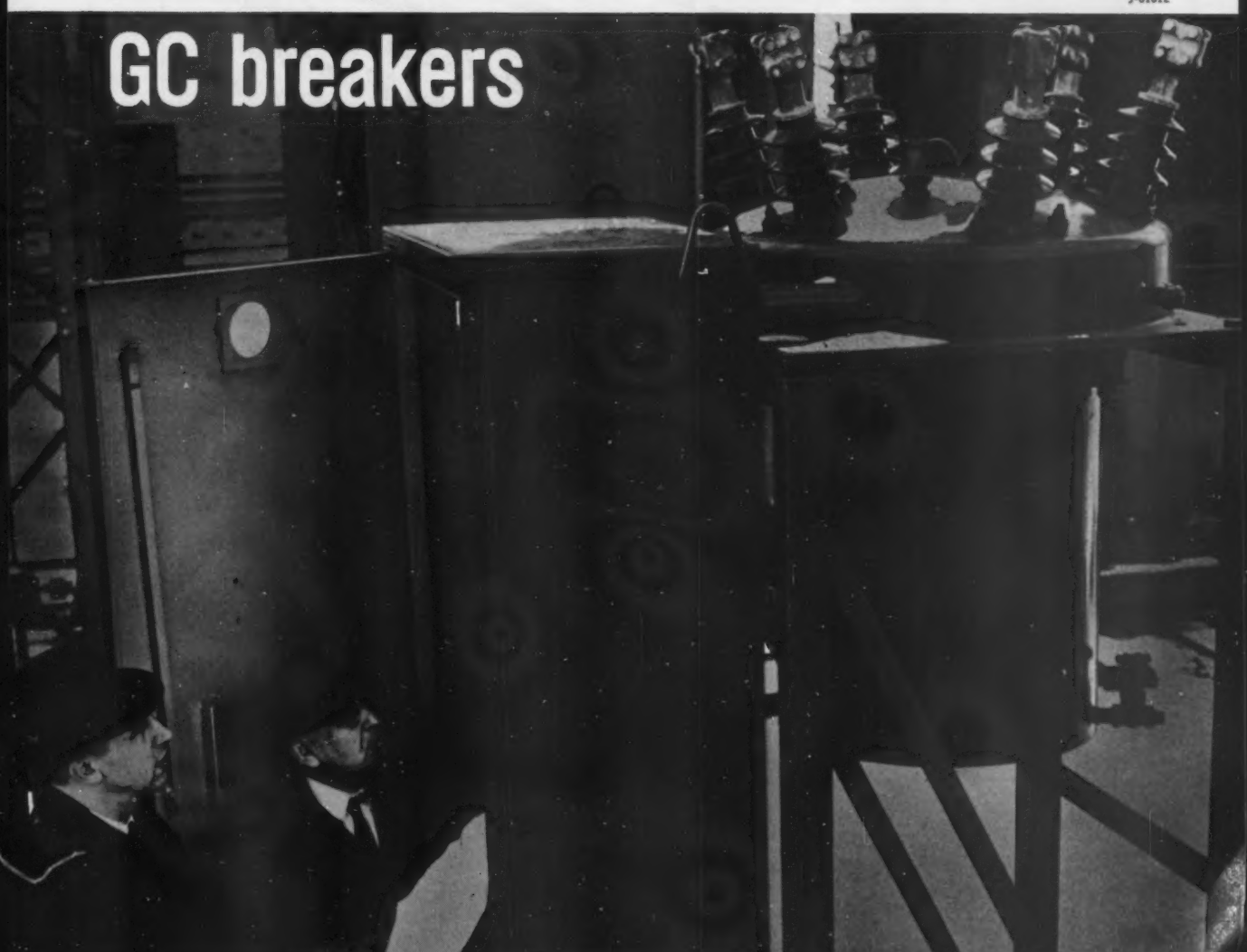
First, these GC breakers interrupt essentially within three cycles, from 0 to 100% of rating. This provides greater protection against line and equipment damage due to faults—reduces possibility of line burndown. It also reduces arcing time within the breaker which results in less contact burning and oil contamination and, therefore, less maintenance.

Second, simple solenoid operating mechanism minimizes maintenance.

Third, closing current requirements have been slashed to less than one-half compared to units available as recently as three years ago. Result here is lower installation costs since much smaller control cables and transformers or batteries can be used.

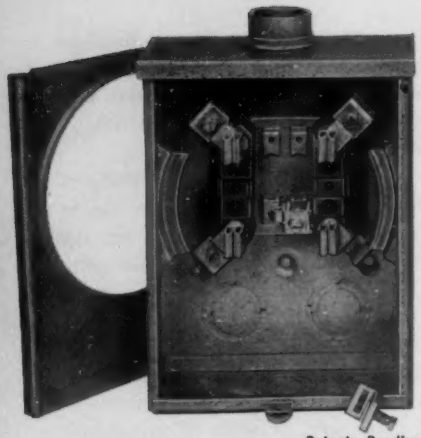
For complete facts, call your Westinghouse representative, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. *You can be sure . . . if it's*

Westinghouse



J. M. Kadetsky (right) of Pennsylvania Electric Company and T. C. Pitzer, Westinghouse Sales Engineer, discuss a 14.4 kv, 100 mva, GC Breaker. A good performance record has been logged by this unit installed in Pennsylvania Electric's Boulevard Substation, Johnstown, Pa.

J-61012



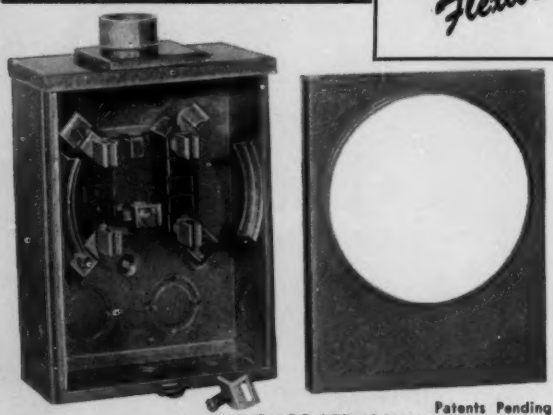
Patents Pending
CATALOG SL-AL-100FH-1 1/4"
Size 10 1/2" x 8" x 3 5/8"
4 Terminals—100 to 120 Ampere
Aluminum Extruded Connectors

Patents Pending
CATALOG WV-011-A-1-1/4"
Size 8" x 8" x 3 5/8"
4 Terminals—100 to 140 Ampere
Standard Copper Connectors

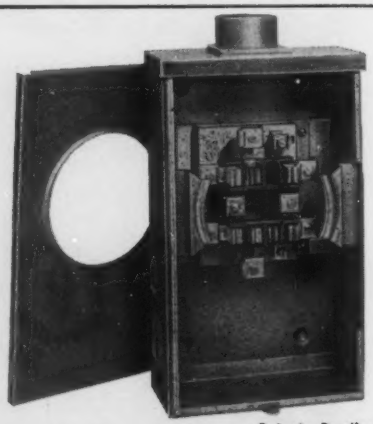
LOOKING for Something? Designed for the Application

B & C'S ORIGINAL RINGLESS METER SOCKETS
LIGHT DUTY, MEDIUM DUTY, HEAVY DUTY SOCKETS
SINGLEPHASE, POLYPHASE, COMBINATION DEVICES
HORIZONTAL GANG, VERTICAL GANG, SOCKET UNITS
INDOOR AND OUTDOOR TRANSFORMER CABINETS
COMBINATION TRANSFORMER - METER ENCLOSURES
UNIQUE TRANSFORMER MOUNTING BRACKETS
OUTDOOR AND INDOOR METERING ENCLOSURES
SERVICE MAST CLAMPS AND OTHER ACCESSORIES
INDOOR AND OUTDOOR METER CONNECTING CABINETS
METER SOCKET ACCESSORIES, PARTS, SPECIAL DEVICES

B & C's Revolutionary, Unique, Designs Flexible, and Unexcelled in Performance Keeping Pace With the Electrical Industry



Patents Pending
CATALOG WVL-AL-0100A-1 1/4"
Size 10 1/2" x 8" x 3 5/8"
4 Terminals—100 to 120 Ampere
Aluminum Extruded Connectors



Patents Pending
CATALOG WVHDP-AL-2007A-2"
Size 17" x 10" x 5 1/2"
7 Terminals—150 to 200 Ampere
Aluminum Extruded Connectors

B and C

Your Seal of Dependability and Safety

Write for descriptive catalog containing installation data and current price list.

METAL STAMPING COMPANY

590 MEANS ST., N. W. • ATLANTA, GEORGIA

New series of tables extended to include larger hourly rates

A NEW SERIES of estimating tables, completely revised in the light of more recent jobs and experience, are presented in this issue and will appear from month to month in forthcoming issues. These electrical estimating data sheets cover labor only and are arranged alphabetically with the basic material headings as a title for each tabulation.

Labor units given in these tabulations are based on a minimum of interference during work progress. The averages listed do not provide for abnormal job conditions, and any such abnormal conditions will require adjustments by the user, based on his experience.

The work units covered by each table are composed of one or more separate but closely related operations necessary for the complete installation of a particular basic item of electrical equipment. These operations associated with the basic material are described at the bottom of each table.

Most of the electrical estimating tabulations follow the same form. Column 1 at the left shows the size of the material to be installed. The second column from the left gives the time required to install the material, and it should be noted especially that this "productivity" column may be based on individual units or in the case of cable or conduit on units of 100 feet or 1,000 feet. The abbreviations "Ea." for each, "C" for hundreds, and "M" for thousands in Column 2 indicate the basis of the labor hours.

Columns 3 to 13, from the left, give the actual labor costs in dollars per unit of installation, at various hourly wage rates.

When calculations are being made for an hourly wage rate that doesn't correspond to any of the rates listed in Columns 3 to 13, the user may multiply the number of hours in Column 2 by 100 and this will give the labor cost based on an hourly wage rate of $1 per hour. By multiplying this by the hourly wage rate that actually applies in the user's locality, the exact labor cost of the operation may be obtained. Labor costs obtained in this way will be for units, hundreds of feet, etc., as given in heading of Column 2 of the table.

The labor units covered by the tables represent direct job labor costs and do not include delivery of material to site, engineering, estimating, or any other indirect cost.

As will be noted, some of the electrical estimating tabulations to be given will be for independent operations, such as excavating, backfilling, etc. These are included for use in preparing estimates on work of a special nature not covered under a specific table heading.

Tables will appear in alphabetical order.

CONDULETS "HY WALL THREADED"
TYPES "A - B & E"

CONDUIT SIZE	HOURS EACH	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50
1/2"	.23	.46	.52	.58	.63	.69	.75	.81	.86	.92	.98	1.04
3/4"	.23	.46	.52	.58	.63	.69	.75	.81	.86	.92	.98	1.04
1 "	.28	.56	.63	.70	.77	.84	.91	.98	1.05	1.12	1.19	1.26
1 1/4"	.31	.62	.70	.78	.85	.93	1.01	1.09	1.16	1.24	1.32	1.40
1 1/2"	.33	.66	.74	.83	.91	.99	1.07	1.16	1.24	1.32	1.40	1.49
2 "	.33	.66	.74	.83	.91	.99	1.07	1.16	1.24	1.32	1.40	1.49
2 1/2"	.38	.76	.86	.95	1.05	1.14	1.24	1.33	1.43	1.52	1.62	1.71
3 "	.45	.90	1.01	1.13	1.24	1.35	1.46	1.58	1.69	1.80	1.91	2.03
4 "	.45	.90	1.01	1.13	1.24	1.35	1.46	1.58	1.69	1.80	1.91	2.03
		TYPES C - LB - LR - LL - LF - L - LBB - LFE - LRB										
1/2"	.28	.56	.63	.70	.77	.84	.91	.98	1.05	1.12	1.19	1.26
3/4"	.31	.62	.70	.78	.85	.93	1.01	1.09	1.16	1.24	1.32	1.40
1 "	.33	.66	.74	.83	.91	.99	1.07	1.16	1.24	1.32	1.40	1.49
1 1/4"	.33	.66	.74	.83	.91	.99	1.07	1.16	1.24	1.32	1.40	1.49
1 1/2"	.38	.76	.86	.95	1.05	1.14	1.24	1.33	1.43	1.52	1.62	1.71
2 "	.42	.84	.95	1.05	1.16	1.26	1.37	1.47	1.58	1.68	1.79	1.89
2 1/2"	.45	.90	1.01	1.13	1.24	1.35	1.46	1.58	1.69	1.80	1.91	2.03
3 "	.5	1.00	1.13	1.25	1.38	1.50	1.63	1.75	1.88	2.00	2.13	2.25
4 "	.56	1.12	1.26	1.40	1.54	1.68	1.82	1.96	2.10	2.24	2.38	2.52

E-102-B

LABOR: Includes handling material and installing unit.

10-61

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CONDULETS "HY WALL THREADED"
TYPE T AND TB

CONDUIT SIZE	HOURS EACH	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50
1/2"	.33	.66	.74	.83	.91	.99	1.07	1.16	1.24	1.32	1.40	1.49
3/4"	.33	.66	.74	.83	.91	.99	1.07	1.16	1.24	1.32	1.40	1.49
1 "	.38	.76	.86	.95	1.05	1.14	1.24	1.33	1.43	1.52	1.62	1.71
1 1/4"	.38	.76	.86	.95	1.05	1.14	1.24	1.33	1.43	1.52	1.62	1.71
1 1/2"	.42	.84	.95	1.05	1.16	1.26	1.37	1.47	1.58	1.68	1.79	1.89
2 "	.45	.90	1.01	1.13	1.24	1.35	1.46	1.58	1.69	1.80	1.91	2.03
2 1/2"	.5	1.00	1.13	1.25	1.38	1.50	1.63	1.75	1.88	2.00	2.13	2.25
3 "	.56	1.12	1.26	1.40	1.54	1.68	1.82	1.96	2.10	2.24	2.38	2.52
4 "	.56	1.12	1.26	1.40	1.54	1.68	1.82	1.96	2.10	2.24	2.38	2.52

E-101-B

LABOR: Includes handling material and installing unit.

10-61

CONDUIT COUPLING - (SLIP TYPE)

CONDUIT SIZE	HOURS EACH	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50
1/2"	.68	1.36	1.53	1.70	1.87	2.04	2.21	2.38	2.55	2.72	2.89	3.06
3/4"	.8	1.60	1.80	2.00	2.20	2.40	2.60	2.80	3.00	3.20	3.40	3.60
1 "	.9	1.80	2.03	2.25	2.48	2.70	2.93	3.15	3.38	3.60	3.83	4.05
1 1/4"	1.1	2.20	2.48	2.75	3.03	3.30	3.58	3.85	4.13	4.40	4.68	4.95
1 1/2"	1.4	2.80	3.15	3.50	3.85	4.20	4.55	4.90	5.25	5.60	5.95	6.30
2 "	1.8	3.60	4.05	4.50	4.95	5.40	5.85	6.30	6.75	7.20	7.65	8.10
2 1/2"	2.2	4.40	4.95	5.50	6.05	6.60	7.15	7.70	8.25	8.80	9.35	9.90
3 "	2.6	5.20	5.85	6.50	7.15	7.80	8.45	9.10	9.75	10.40	11.05	11.70
4 "	3.0	6.00	6.75	7.50	8.25	9.00	9.75	10.50	11.25	12.00	12.75	13.50
5 "	4.0	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00

E-101-B

LABOR: Includes handling material, cutting pipe, threading and reaming pipe, installing coupling and securing.

10-61

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News of the industry

edited for Southern readers

NEMA sets final plans for 35th annual meeting

ELECTRICAL MANUFACTURERS from all sections of the country will assemble at the Plaza Hotel in New York City on November 16 for the 35th annual meeting of the National Electrical Manufacturers Association.

The program will be divided into two parts—a morning business session, and a dramatic review of the electrical industry's progress immediately after the general membership luncheon.

A. D. R. Fraser, president of NEMA, and president of Rome Cable Div., Aluminum Company of America, Rome, N. Y., will preside at the one-day session, and keynote the morning program with highlights of association activities during 1961.

Joseph F. Miller, managing director, will discuss NEMA's internal operations, including staff activities, finances, membership, and other related matters.

The association's 1962 program and budget will be presented by A. E. Pringle, II, treasurer of NEMA, and president of Pringle Electrical Manufacturing Co., Philadelphia, Pa.

Other features of the morning business session will include the election of new members to the NEMA board of governors; and progress reports of Walsh-Healey Proceedings, as they pertain to electrical manufacturers; the NEMA Room Air-Conditioner Section's certification program; and the association's new, broad-scale public relations project.

The membership luncheon will be brief and include only the introduction of new NEMA officers and the presentation of industry awards in order to permit time for a fast-moving, half-hour show—"Eyewitness to the Electrical Industry." Professionally written and staged, the show will provide flashbacks to history, a summary of where the industry stands today, and a view of what lies ahead.

Underground lines would insure power during war

A POWER TRANSMISSION industrialist has urged President Kennedy to correct "a critical flaw in our ability to survive nuclear attack" by placing electric power transmission lines underground where they would be less vulnerable to enemy action and sabotage.

In a recent letter to the President, with copies sent to Defense Secretary Robert S. McNamara, OCDM director Frank B. Ellis, and Gen. Anthony McAuliffe, director of the New York State Civil Defense Commission, Jack Jerome, president of Jerome Hydraulics Co., Inc., Mineola, Long Island, N. Y., called overhead transmission lines the "Achilles' heel in our civil defense program."

Mr. Jerome pointed out that "loss of overhead transmission lines could paralyze large areas and entire cities. They are particularly vulnerable because the great length of exposed wire and the towers spaced far apart preclude an adequate defense."

Citing the fact that while "the cost of relocating all transmission lines underground would be prohibitive," Mr. Jerome emphasized that "those vital areas which are wholly dependent on overhead networks should immediately plan for duplicate underground lines." He credited the installation of some transmission lines operating underground to "the farsightedness of utility engineers and city planners."

The power transmission industrialist called upon the Administration to appoint a committee of public utility engineers and other industry experts to make a prompt and thorough study of the problem and to draw up plans for insuring a power supply which would be impervious to enemy attack.

Controlled beam lamps dramatize tall building

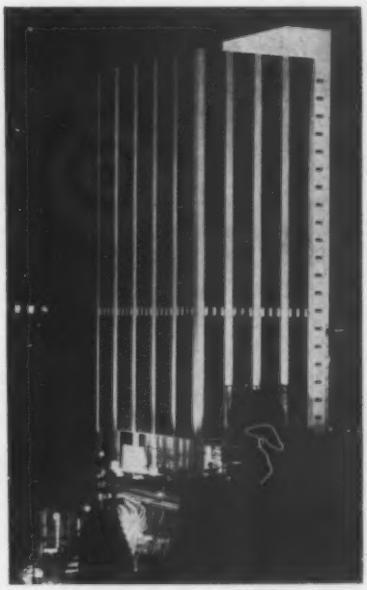
FIRST APPLICATION of a newly developed six-volt, 120-watt reflector lamp, which has a highly concentrated filament and a very narrow beam spread, is the illumination of the six-foot wide marble columns extending the full height of the new 22-story Georgia Power Company building, in Atlanta.

The new lamp, produced by the Lighting Products Division of Sylvania, has been designated the PAR 64X1. It is rated at 2,000 hours life and develops 250,000 beam candlepower. The lamp is equipped with a matte black light shield, which eliminates a direct glare from the filament.

In combination with the precise reflector control, the result is a narrow beam spread of only four by 6½ degrees, and is the least scattered light of any PAR lamp currently known to be available.

In the case of the Georgia Power installation, the lamps spread a tightly controlled ribbon of light along the six-foot wide marble columns on three sides of the new building. Each column is illuminated with nine PAR 64X1's aimed at the top and washing down to the 150-foot level of the 300-foot facade.

Three PAR 64X2's fill in the 30-foot to 150-foot level. These are somewhat similar lamps, but are rated at 120 volts, 500 watts with a



A night view of the Georgia Power building shows the shafts of light.

Sylvania's new reflector lamps operate at six volts and 120 watts.

2,000-hour life. By using a newly designed compact coiled-coil filament, a beam spread of eight by 20 degrees is achieved. The beam candlepower developed by this lamp is 240,000.

The Georgia Power Company installation was designed and engineered by Abe Feder, of Lighting by Feder, in cooperation with Sylvania.

Southwest Power Pool offers energy exchange

ELEVEN INVESTOR-OWNED electric utility companies of the Southwest Power Pool have offered to exchange 1,500,000 kw of seasonal off-peak electric power with the Tennessee Valley Authority, J. Robert Welsh, chairman of the executive committee of the pool, has revealed.

Mr. Welsh said that such an exchange would affect economies for both Southwest Power Pool companies and TVA, and would be of particular benefit to customers in the areas served by both the government power facility and the investor-owned companies.

The plan would be possible because the pool member companies have their highest usage of electricity during the summer months, while TVA has its highest usage during the winter months. Thus, the pool has surplus power in the winter which it could exchange with TVA, and TVA could furnish power to the pool during the summer period.

The Southwest Power Pool was formed by investor-owned companies to exchange power during World War II. Following the war it continued to operate for purposes of electric exchange, and four months ago, the power pool companies announced plans for constructing a 4,000-mile network of extra-high voltage transmission lines at a cost of more than $300 million.

Mr. Welsh pointed out that such an exchange was in keeping with the electric industry's policy of providing for system interconnections to facilitate interchange of electric energy. It would be a further development of the interconnection policy carried out between electric utility systems for many years.

Member companies of the Southwest Power Pool joining in the offer are Arkansas Power and Light Co.; Central Louisiana Electric Co., Inc.; Empire District Electric Co.; Gulf States Utilities Co.; Kansas Gas and Electric Co.; Louisiana Power and Light Co.; Mississippi Power and Light Co.; New Orleans Public Service, Inc.; Oklahoma Gas and Electric Co.; Public Service Company of Oklahoma; and Southwestern Electric Power Co.

Mississippi engineers organize Jackson unit

PROFESSIONAL ENGINEERS in the Jackson, Miss., area have received their Jackson Chapter charter from the board of directors of the Mississippi Society of Professional Engineers.

The Jackson Chapter will include professional engineers in Hinds, Copiah, Madison, Rankin, Simpson, and Yazoo Counties.

Chapter officers elected include P. A. Koonce, president; Eugene M. Johnson, president-elect; A. W. Hardin, secretary-treasurer; S. C. Commander, member of state board of directors; and O. G. Maganos, member of the chapter board of directors.

New Orleans to hold electrical exposition

THE ELECTRICAL ASSOCIATION of New Orleans, Inc., will sponsor a Southern Electrical Exposition to be held April 2, 3, and 4, 1962, at the New Orleans Municipal Auditorium.

This will be the first electrical equipment show for the entire electrical industry in New Orleans since World War II.

Manufacturers of electrical equipment from all over the country, whose products cover the full range of commercial and industrial applications, will be invited to participate in the exposition. It is expected that visitors from all over the South will be in attendance at the show.

Site of the exposition, the municipal auditorium, is ideally suited to show the latest developments in the industry. It contains 32,250 square feet of air conditioned space which will provide approximately 160 exhibition booths. Large parking lots adjoin the auditorium, which is only a few blocks from the central business area in New Orleans. It is easily accessible from downtown hotels by car, cab, or public transit.

The sponsor, the Electrical Association of New Orleans, is a nonprofit organization formed in 1921 to serve the electrical industry in the New Orleans area. Charles J. Sinnott is president and Z. Kermit Remy is executive vice-president.

Robert J. Page is exposition chairman and S. A. Cuyler is vice-chairman. Other members of the steering committee are E. N. Avegno and L. A. Dav.

Steelduct names agents for Southern territories

TWO NEW REPRESENTATIVES have been named recently for Southern areas by the Steelduct Co., of Youngstown, Ohio.

James and Associates, Inc., will serve in Florida, with headquarters at 7545 N. W. 26th Ave., Miami.

Covering Mississippi and Louisiana will be the E. J. Hagan Co., 2837 Banks St., New Orleans.

Square D enlarges Atlanta warehouse

SQUARE D COMPANY has completed a 10,000 square foot addition to its warehouse facilities in Atlanta, Ga., M. P. Kartalia, vice-president of marketing, has announced.

MERCURY VAPOR LIGHTING—Modern mercury vapor luminaires offer attractiveness to St. Louis' Mark Twain Expressway during the day, as well as safety and comfort to expressway motorists after dark. The luminaires are General Electric M-400, each designed to produce 20,500 lumens.

The new steel building is adjacent to the electrical equipment manufacturer's modern 31,000 square foot regional assembly plant at 1401 Marietta Blvd., N.W., which includes 5,000 square feet of warehouse space.

The expanded warehouse serves sales territories based at Birmingham, Ala.; Pensacola, Fla.; Knoxville, Tenn.; Richmond, Va.; Raleigh, Greensboro, and Charlotte, N. C.; Greenville and Columbia, S. C.; as well as Atlanta and Albany, Ga.

"The new facilities will allow us to almost double our shipments eventually," said S. T. Walz, Southeastern region manager. He noted that a redistribution warehouse is located in Tampa to supply customers in southern Florida.

Payne accepts position of Dallas chief inspector

THE RECENT APPOINTMENT of R. L. "Bob" Payne to the post of chief electrical inspector for the city of Dallas, Texas, has been announced by officials of that city.

Mr. Payne is an alternate member of the executive council of the IAEI, and holds several committee appoint-

R. L. Payne

ments in the organization's Southern Section. He also aided in organizing the North Central Texas Division of the IAEI.

His electrical studies have included courses at the Dallas public evening school and Southern Methodist University.

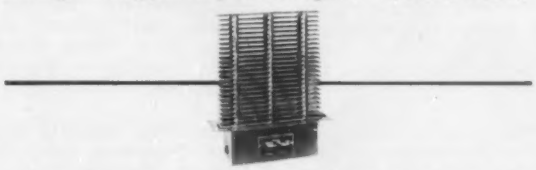
Mr. Payne twice weekly teaches the National Electrical Code for journeyman electricians as well as advanced application of the Code.

Nebraska firm appoints Southern representative

VALLEY MANUFACTURING CO., Valley, Neb., has announced the appointment of Osgood & Assoc., 988 Spring St., N.W., Atlanta 9, Ga., as a representative for its steel lighting standard division in Georgia, Alabama, Florida, and eastern Tennessee.

The ELECTRIC Heaters with POSITIVE PROTECTION!

A policeman is a symbolic connection with Electromode heaters, because he represents the three-point reputation Electromode has earned in the electric heating field: Safety, Protection, and Authority. The exclusive Electromode Aluminum Safety Grid is the key to this reputation, and only Electromode has it. There are no exposed hot wires. No glowing coils. All heating elements are permanently embedded deep inside the exclusive aluminum casting, assuring positive protection against fire, shock, or burn.



Yes, Electromode's remarkable aluminum grid heating element offers positive protection to the homeowner. It is one of the best known metals for conducting as well as radiating heat—yet its surface temperatures in operation remain amazingly low. But now look at it from your standpoint, Mr. Contractor. This much-desired aluminum grid offers you, too, positive protection in other ways. Trouble-free Electromode grids are guaranteed five years against burnout. Your profits are protected on the original sale because you eliminate service headaches. Callbacks are virtually non-existent. You install a guaranteed Electromode unit and forget it, then reap mounting dividends in valuable good will and customer satisfaction. That's why more contractors turn to Electromode for all flameless heating requirements.

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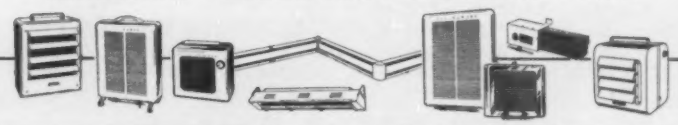


For more details on above items, use reply card on page 19

Eagle sales clinic gives new product previews

A THREE-DAY packaging and sales clinic was held recently by Eagle Electric Manufacturing Co., at company headquarters in Long Island City, N. Y.

Louis Ludwig, president and founder of the Eagle organization, previewed new products in development and emphasized the dependency of todays' business on research and development, the coming era of automation, and the urgent need for business to remain aware and alert, to combat the communist threat.

Mr. Ludwig pointed out that 71 new items are being unveiled in the new Eagle catalog, including the new E-Z wire pressure terminal receptacles and an expanded line of quiet switches.

S. B. Kluger, vice-president and general manager, traced the past 41 years of Eagle history and predicted a continuing upward surge in America's growth, with accelerated Eagle growth and contribution to the electrical industry.

Sales manager S. Jay Atkin delineated the continuing and constant changes in channels of distribution and unveiled numerous new displays, assortments, and packaging for Eagle consumer products, plus new and revised marketing aids.

Sales clinics illuminated problems faced by salesmen in specialized markets, while profitable interrelationships of trade advertising and a publicity campaign were pin-pointed with case histories by S. Bayne, manager of advertising.

Dates ahead

National Rural Electric Cooperative Association, Region X, Cortez Hotel, El Paso, Texas, Oct. 12-13, 1961.

American Institute of Electrical Engineers, Fall General Meeting, Statler-Hilton Hotel, Detroit, Mich., Oct. 15-20, 1961.

International Association of Electrical Inspectors, Southern Section, Grove Park Inn, Asheville, N. C., Oct. 16-18, 1961.

Southeastern Electric Exchange, Engineering and Operation Section Conference, Buena Vista Hotel, Biloxi, Miss., Oct. 26-27, 1961.

National Rural Electric Cooperative Association, Region II, Golden Gate Hotel, Miami Beach, Fla., Oct. 30-31, 1961.

Fourteenth Annual Power Distribution Conference, University of Texas, Austin, Texas, Oct. 30-Nov. 1, 1961.

National Rural Electric Cooperative Association, Region VIII, Jung Hotel, New Orleans, La., Nov. 2-3, 1961.

Southeastern Electric Exchange, Sales, Advertising, and Public Relations Conference, Tides Hotel, St. Petersburg, Fla., Nov. 15-17, 1961.

National Electrical Manufacturers Association, Annual Meeting, Traymore Hotel, Atlantic City, N. J., Nov. 16, 1961.

American Institute of Electrical Engineers, Winter General Meeting, Hotel Statler, New York, N. Y., Jan. 28-Feb. 2, 1962.

Missouri Valley Electric Association, Industrial and Commercial Sales Conference, President Hotel, Kansas City, Mo., Feb. 15-16, 1962.

Sixth National Electrical Industries Show, New York Coliseum, March 11-14, 1962.

National Electric Comfort Heating Exposition and Symposium, Sherman Hotel, Chicago, Ill., March 19-21, 1962.

Southeastern Electric Exchange, 29th Annual Conference, Boca Raton Hotel and Club, Boca Raton, Fla., March 26-28, 1962.

American Institute of Electrical Engineers, South Central District Meeting, Hotel Peabody, Memphis, Tenn., April 4-6, 1962.

Missouri Valley Electric Association, Engineering Conference, Muehlebach Hotel, Kansas City, Mo., April 11-13, 1962.

Illuminating Engineering Society, Southeastern Region, King Edwards Hotel, Jackson, Miss., April 12-13, 1962.

Southeastern Electric Exchange, Engineering and Operation Section Conference, Atlanta Biltmore Hotel, Atlanta, Ga., April 12-13, 1962.

AIEE-ISA-ARS-IAS, National Telemetering Conference, Sheraton-Park Hotel, Washington, D. C., May 23-25, 1962.

Illuminating Engineering Society, Inter Mountain Region, Western Skies Hotel, Albuquerque, N. Mex., May 24-25, 1962.

G-E elects Phillippe as company president

GERALD L. PHILLIPPE has been named president and Cramer W. LaPierre has been named executive vice-president of the General Electric Co.

The announcement was made by Ralph J. Cordiner, chairman of the board and chief executive officer for the company. Concurrently, both men were elected directors. Mr. Phillippe had been comptroller and principal financial officer of the company since 1953, while Mr. LaPierre formerly was vice-president and group executive in charge of the company's Electronic and Flight Systems Group.

The new president was graduated

Gerald L. Phillippe

from the University of Nebraska in 1933 with an MA degree, joining G-E that same year. In 1935 he became a traveling auditor with the company, then a statistician, auditor of an operating division, and later division

Cramer W. LaPierre

comptroller. He also held the position of general manager for the Accounting Services Div.

Mr. LaPierre attended the University of Missouri, and joined G-E

in 1924. He later became general manager of the Flight Propulsion Div., and was elected a vice-president in 1952. In 1954 he became a group executive.

Georgia Tech to hold short computer study

A ONE-WEEK COURSE designed to orient senior technical personnel in the latest concepts underlying the areas of instrumentation, analog computers, digital computers, and automation will be offered to the public on the campus of the Georgia Institute of Technology, Atlanta, February 12-16, 1962.

The automation portion of the course will encompass history and terminology, design of an automatic system, role of feedback control, studies of automation in manufacturing and chemical process industries, applications of data processing equipment, and economics of the systems.

Instructor for this section will be Dr. Joseph Krol, professor of industrial engineering at Georgia Tech.

In the instrumentation section of the course, review will be made of basic concepts of industrial instrumentation, classification of instrument and control devices, basic control loops, and control media and hardware. Examples will be given of instrumentation in heating plants, chemical process industries, and other selected applications.

In the analog computer division, under Robert S. Johnson, MS, research engineer at the Georgia Tech Computer Center, delegates will study course material designed in relation to the Georgia Tech analog computer facilities. Fundamentals of analog computation and computing equipment will be illustrated.

The digital computer section, to be headed by Charles Reed, MS, research engineer at the computer center, will cover course material designed in relation to the school's digital computer facilities. Fundamentals of digital computation and computing equipment will be illustrated by examples, and delegates will have an opportunity to program their own.

Sessions will be held Monday through Friday and will include automation sessions from 8:30 to 10:00 a.m., analog computer sessions from 10:15 to 12:00 noon, instrumentation sessions from 1:15 to 2:45 p.m., and digital computer classes from 3:00 to 4:30 p.m.

A fee of $125.00 will include tuition, supplies, and necessary textbooks. Applications should be made promptly, as registration will be limited. Refund of registration fee can be made if notice of withdrawal is received before the registration deadline, February 5, 1962.

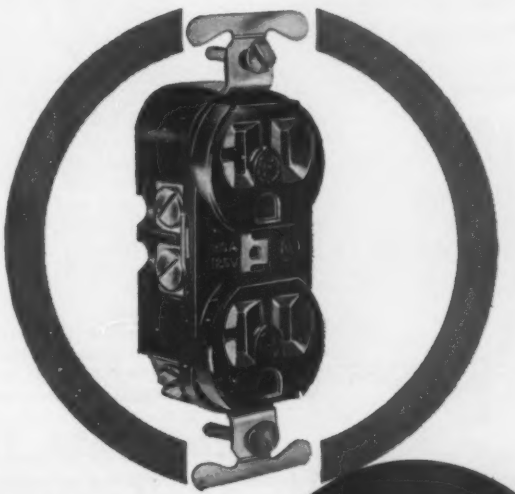
Further details may be obtained from the Director of Short Courses and Conferences, Georgia Institute of Technology, Atlanta 13, Ga.

NEW

CIRCLE F

20-AMP

"U"-GROUND DEVICES



... Section 220-3 (b) of the 1959 National Electrical Code states ...

"For the small appliance load in kitchen, laundry, pantry, dining room and breakfast room of dwelling occupancies, (1) 2 or more 20-ampere branch circuits in addition to the branch circuits specified in paragraph 220-3 (a) shall be provided for all receptacle outlets (other than outlets for clocks) in these rooms, and such circuits shall have no other outlets."

Designed to provide full compliance with the revised Code, Circle F's *new* No. 2532 does much more! It becomes a "universal" outlet! It accommodates appliances, heavy-duty portable tools, business machines, etc., having substantial energy requirements, where the new 20 A.-125 V. plug cap (No. 2528) is necessary. It also accommodates 15 A.-125 V. 3 wire U-ground and standard parallel blade caps. One outlet for all! Circle F's quality is tops and the price is right. Contact your Circle F representative for complete details.

CIRCLE F MFG. CO.

TRENTON 4, NEW JERSEY

General Electric offers new area lighting units

GENERAL ELECTRIC has launched a major area lighting marketing program with a significant expansion of its product line and a new and greatly simplified application guidebook, the "Area Lighting Designer's and Buyer's Guide."

The company added two new mercury units and two fixtures utilizing Quartzline lamps to its traditional line of floodlights. Rounding out the new luminaire package are three post-mounted units—one for incandescent only, one for mercury and incandescent, and one fluorescent. In addition, a "Quick Response" photoelectric control was developed.

The new mercury units are available in two sizes, up to 400 watts in the smaller size, and 700, 1,000, or 1,500 watts in the larger size. Both models resemble small television sets in appearance, are intended for applications where lights will be used for more than 1,000 hours a year and where a wide angle beam is desirable.

All units feature the first true "powerpack" design, with built-in ballasts for neat appearance and a saving in installation time (only a simple terminal board connection is required).

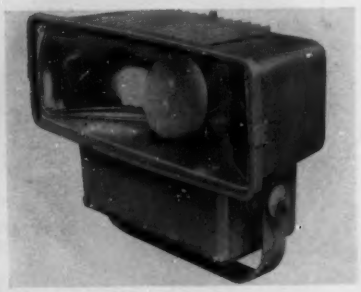
In the incandescent line, General Electric has made available two models employing the Quartzline lamp, with its higher lumen output, tightly controlled beam, longer life, and high-lumen maintenance. For these lamps, the company has developed the QF-500 (500-watt) and the QF-1500 (1,500-watt). The units are marked by a very wide horizontal beam and a very narrow vertical beam with sharp cutoff.

Designed primarily for mercury, but accommodating incandescent as well, is the PMA-115, a canopy-covered luminaire with a shatter-resistant acrylic-plastic refractor. It is available with an individual photoelectric control or for remote switching and can be customized with special insignia (lighted at night) for churches, fraternal organizations, trade-marks, and the like.

For fluorescent applications, the company has added a unique luminaire—the PMF-104—a post-mounted fluorescent fixture. The unit is designed for ten to 20-foot mounting heights, and carries a single four-foot 6,900-lumen Power Groove lamp.

For incandescent lamps only, G-E produced the inexpensive PMG-114, a design with a "coolie hat" canopy and rippled-glass globe, that will take up to a 6,000-lumen, 405-watt lamp. The unit gives a soft, practically glare-free light distribution of a circular shape (i.e. type V). Applications include walkways, malls, building entrances, and recreation areas.

G-E Quartzline floodlights have wide horizontal, narrow vertical beam.



The powerpack design mercury floodlight from G-E gives high efficiency.

New G-E fluorescent post-mounted fixture gives 6,900 lumens of light.

Utility growth gaining, recent survey shows

THE ELECTRIC UTILITY industry is "the greatest growth industry in the United States," says *The Value Line Investment Survey* in a recent report covering 82 investor-owned utilities.

Even during the 12-month period ending June 30, which encompassed the recession, utility revenues increased about six per cent over the preceding 12 months, the survey points out. From 1950 through 1960, total electrical energy generated by the utilities increased about 2½ times. Even the chemical industry, practically a synonym for economic growth, could not match the performance of the electric utilities.

Forecasts by the investor-owned utilities indicate that electric energy output will continue to double every ten years in line with the past experience of the industry during its nearly 80-year history, Value Line reports.

While continued expansion of tax-supported power is foreseen by the survey, "it is not likely to jeopardize the future progress of the investor-owned utility industry." However, the survey suggests that there is clearly no room for complacency on the part of the private companies.

While utility earnings will probably continue to grow impressively, prospects for the year ahead are amply discounted by most utility stocks, the survey concludes.

Williams Electric opens new Gulfport facilities

NEW FACILITIES for an office, display area, and warehouse have been opened in Gulfport, Miss., by the Joe Williams Electric Supply Co., wholesale distributor.

Frank Rosskopf will head the new office, it was announced by Joe H. Williams, president of the home company in Jackson, Miss.

Located off Pass Road at 15th Ave., the Gulfport facility features a lighting fixture display area of 1,000 square feet for customer convenience in making selections.

South Mississippi, Alabama, and Louisiana will be served by the new branch, which distributes numerous brands of electrical supplies and equipment.

Pringle appoints Scott to serve Georgia area

PRINGLE ELECTRICAL Manufacturing Company has named O. V. Scott, Jr., and Associates, 305 Techwood Drive N.W., Atlanta 13, as Georgia representative for its complete line of service entrance and industrial switches, it was announced recently by Eustace C. Soares, sales manager.

Mr. Scott received a degree in electrical engineering from Auburn University and during World War II was assistant chief of the electrical section with the United States Corps of Engineers. Mr. Scott was since associated with Roller-Smith Corp., as Southeastern regional manager, and in 1955 established offices as O. V. Scott, Jr., and Associates.

Penn-Union names Roth as new representative

THE PENN-UNION Electric Corporation has appointed the John W. Roth Company as agent for their sales in Kentucky, Indiana, and southern Illinois.

Mr. Roth will have his headquarters in Indianapolis.

News about people

Two men have been recently cited for recognition as Fellows by the American Institute of Electrical Engineers.

William Harding, of Charlotte, N. C., was recognized "... for contributions to the design and construction of transmission lines and substations." Mr. Harding is a transmission engineer for Duke Power Co.

The honor was also conferred on **Lloyd T. Williams,** chief electrical engineer, Southwestern Electric Power Co., Shreveport, La., "... for contributions to the design and development of oil field electric supply systems."

Theodore A. Mager, until recently field sales manager for Pass & Seymour, Inc., has been appointed general sales manager of the company.

R. M. Salisbury, P & S vice-president, made the announcement. Mr. Mager has an engineering background, as well as wide experience in advertising and sales promotion prior to his appointment as field sales manager in 1959.

Theodore A. Mager

Recently named assistant sales managers at Central Transformer Corp., Pine Bluff, Ark., are **G. W. Fugate** and **J. William Sanders,** it has been announced by **John Caruthers,** vice-president of the company.

Prior to joining Central in 1959, Mr. Fugate served as a sales engineer with Nelson Electric Manufacturing Co., Tulsa, Okla. Other work experience includes two years in sales for Pure Oil Co., Tulsa, and two years as production superintendent for Stekoll Oil Co., Tulsa.

Mr. Sanders, prior to joining Central in 1960, was with the Apparatus Sales Division of General Electric at Amarillo, Texas. After completing the company's technical marketing program, he served as a sales engineer. He is a graduate engineer of the University of Arkansas.

Appointment of **Dane T. Scag** as assistant director of research has been announced by Allis-Chalmers Research Div.

Since 1957, Mr. Scag had been technical director of C Stellarator Associates, Princeton, N. J., where he was responsible for technical designs and development research investigations in Allis-Chalmers' portion of the project. Prior to that, he was consultant to Princeton University's Matterhorn project for two years, handling development in ultrahigh vacuum systems.

Mr. Scag joined Allis-Chalmers in 1946 as a consultant and design engineer in the betatron laboratory. Prior to that he was an instructor on the research staff of the cyclotron laboratory at the University of Illinois where he received his master of science degree in physics in 1942. He obtained his BS degree in physics from North Central College.

Three new executive appointments have been made by Gedney Electric Co., Inc., of New York, it was announced recently by **Malcolm W. Heron,** president of the company.

Richard W. Noel has been named vice-president in charge of sales. Mr. Noel was formerly sales manager and vice-president of Electrical Fittings Corp.

Elmer Quinn, previously with the

Richard W. Noel

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SEPARATORS used with "Ventilated" FULL-FLEX is your answer!
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For more details on above items, use reply card on page 19

Bulldog Division of ITE Circuit Breaker Co., was appointed sales manager.

Robert Warshaw, with Gedney for the past two years and before that with Burndy Engineering Co., was named assistant sales manager.

H. L. Macon, 58, electrical equipment manufacturer's representative of 2891 Howell Mill Rd., N. W., Atlanta, Ga., died August 20 in a private hospital.

He is survived by his widow, Mrs. H. L. Macon, and his son, Phillip, who will continue to operate his business along with Mrs. Macon and Julian Fincher.

The president of Pennsylvania Transformer Division of McGraw-Edison Co., **W. E. Kerr,** has accepted the chairmanship of the company's Pennsylvania - Lectro Management Group, which includes the J. G.

W. E. Kerr

Dickson Div., Lectromelt Furnace Div., Pennsylvania Transformer Div., and Pittsburgh Lectrodryer.

Fred H. Plank has been named to succeed Mr. Kerr as president of Pennsylvania Transformer, it was announced recently.

In other top personnel changes at Pennsylvania Transformer, **W. R. Swoish,** vice-president and sales manager since 1949, has been named vice-president of marketing and assigned additional responsibilities. **Walter W. Renberg,** now assistant sales manager, will become sales manager.

Fred H. Plank

Mr. Kerr was one of the founders of Pennsylvania Transformer Co., now Pennsylvania Transformer Division of McGraw-Edison Co., and has served as president since 1952. He previously had been associated with the Pittsburgh Transformer Co., which he served as plant manager. He is also a member of the McGraw-Edison board of directors.

Mr. Plank returns to Pennsylvania Transformer, where he formerly held the position of assistant sales manager, after four years as president of Lectromelt Furnace Div. He first joined Pennsylvania Transformer in 1942.

Richard J. Heh has been appointed manager of the Utility Products Division of the Thomas & Betts Co., it was announced recently by **N. J. MacDonald,** president of the manufacturer of electrical terminals, fittings, and raceway accessories.

Mr. Heh has served as assistant manager of the division since 1957. He is a graduate of Carnegie Institute of Technology.

The appointment of **Frank B. Knight** to the position of vice-president and that of **G. Edward Ammerman** to general sales manager of Chromalox, Inc., subsidiary of Edwin L. Wiegand Co., has been announced recently by **Ernest N. Calhoun,** president of the parent company.

Mr. Knight joined Chromalox three years ago as general manager. Prior to his association with the company, he was manager of the Clark Division of the McGraw Edison Corp., Chicago.

Mr. Ammerman has been associated with the company for the past seven years as manager of the appliance products division. Prior to this, he was chief range engineer for the Murray Corp., Scranton, Pa.

Robert L. Pulley has been elected president of the Gulf Power Company of Pensacola, Fla., it was announced recently.

He succeeds **Lansing T. Smith, Jr.,** who is retiring from active duty after serving as president since 1955.

Coincident with Mr. Smith's retirement, **Robert F. Ellis, Jr.,** assistant general manager of the company, has been elected vice-president.

Mr. Pulley was graduated from Auburn University in 1922 with a BS degree in electrical engineering. After several years with the Alabama Power Co., he joined Gulf Power Company in Pensacola in 1925. He was elected a vice-president in 1952. Last year he was also made general manager.

Mr. Smith was graduated from Auburn with a BS degree in electrical engineering in 1919. He then served with General Electric Company until 1921, when he became an engineer with the Alabama Power Company and Dixie Construction Co. With the organization of Gulf Power Co., he became an executive assistant. In 1951 he became a vice-president and was elected chief executive of the company in 1955.

Mr. Ellis, also an Auburn graduate, received his degree in 1943. He started with Gulf Power Company in 1946 as an engineer.

James R. Chambers, Chicago, has been elected president of the 10,000-member Illuminating Engineering Society for 1961-1962.

His election was announced at a meeting of the society's council in New York's Barbizon Plaza Hotel.

James R. Chambers

Mr. Chambers is sales manager, Lighting Products Div., Appleton Electric Co., Chicago.

He has been a member of IES since 1941 and was 1953-54 chairman of the Chicago section, and 1954-56 vice-president of the Midwestern Region.

The appointment of **John M. McGurn** as operating manager was recently announced by the Virginia Electric and Power Co.

Mr. McGurn, who is presently Norfolk district manager, will replace **Walter J. Matthews,** who resigned to become executive vice-president of the Public Service Company of Indiana. Succeeding Mr. McGurn is **Allan S. Hadfield,** formerly system superintendent of distribution.

Mr. McGurn graduated from New Mexico State College and worked for seven years with the El Paso Electric Company before joining Vepco as a test engineer in 1941. He became assistant manager of the Richmond district in 1958, and later that year was appointed Norfolk district manager.

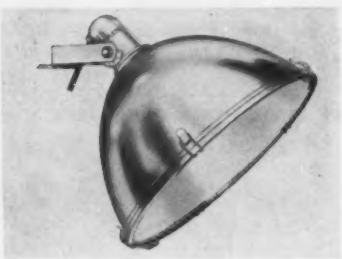
Mr. Hadfield, a graduate of Brown University, joined Vepco in 1940 at Alexandria as a junior engineer. In 1960 he became system superintendent of distribution.

New products

Appleton efficiency floods

Mercflood, one of the new line of Intenso floodlights from Appleton Electric Co., 1701-1759 Wellington Ave., Chicago 13, Ill., is designed to take full advantage of the long life and high efficiency of mercury vapor lamps.

Mercflood photometric data charts



show that it delivers 2½ to three times more light than most general service filament lamps of the same wattage.

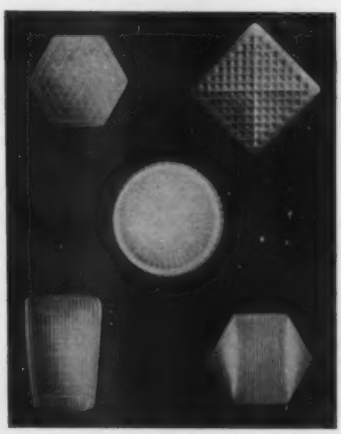
Rated life of the lamp is approximately 7,000 hours, about three years life in the average in-plant installation. This is about six times the average life of the usual filament lamp and is a big factor in cutting lighting maintenance costs.

Exclusive features include an inner auxiliary reflector engineered to intensify light output and a special air and moisture vent wick that keeps reflector and cover glass surfaces free of condensation and dirt.

Write P-1028 on reply card, p. 19

Prescolite geometric fixtures

A new approach to incandescent lighting, glowing geometric shapes which now combine light source and surface decoration into one architectural unit, is offered by the Prescolite Manufacturing Corp., 2229 Fourth St., Berkeley 10, Calif.



The new series of geometric shapes are called Light-Forms, and are made from satin etched Thermopal glass with a hand-blown effect. The shapes provide architects, builders, and lighting specialists with a latitude, depth, and flexibility unavailable in conventional lighting fixtures.

The Light-Forms, which are hexagonal, round, square, and rectangular, can be used individually or in combinations to create patterns of light by varying the number and arrangement of the shapes.

The basic fixture shapes come in the following sizes: hexagonal, 7½ by 8½ inches; round, 7¾ inches in diameter to 12 inches; square, 7⅛ inches; and rectangular, four by 7⅛ inches to seven by 11 inches.

The units are 3½ inches deep and can be used in 28 various pattern combinations. U. L. listed, the fixtures can be mounted to any standard electrical outlet box. They have a wattage range from 40 to 150.

The new elements are waterproof and all exposed metal parts are constructed of black enameled aluminum. They can be installed with or without the aluminum trim plates.

Write P-1029 on reply card, p. 19

Westinghouse static starter

A new static starter for motors, utilizing the Westinghouse-developed silicon-controlled rectifier as the main power switch, has been developed by the general purpose control department of Westinghouse Electric Corp., Buffalo, N. Y., to replace electro-mechanical or ignitron contactors in scores of electrical, general industrial, and military applications.

The Trinistor device, like the silicon cell of which it is a derivative, blocks conduction in the reverse direction. However, it provides complete control of conduction in the forward direction. By proper arrangement of the Trinistor units, it is possible to have total control of a three-phase inductive or resistive load. The low energy level signal required to control a Trinistor device makes it possible to monitor a load directly from a computer without preamplification.

This new product is modular in concept and offers high reliability because there are no moving parts and it is arc-free. In the absence of moving parts to wear, maintenance problems are practically eliminated.

The static starter also offers great potential for remote operations. Examples are automated power plants

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or remote pipeline control. Standardized starter designs are applicable to 20-h.p. motors "across the line," and up to 75-h.p. motors with reduced voltage.

Write P-1030 on reply card, p. 19

Marvin lighting fixtures

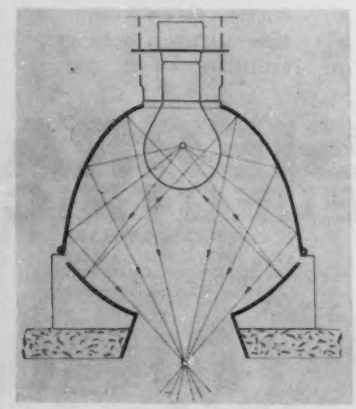
Seven new concepts in recessed incandescent lighting fixtures are now being introduced to the market from Marvin Electric Manufacturing Co., 648 S. Santa Fe Ave., Los Angeles 21, Calif.

Marketed under the name Marco, the new line of over 100 recessed lighting fixtures deals with some of the most common problems confronting lighting specifiers.

Typical are (1) how to alter easily the quantity and intensity of light after an installation has been made, (2) how to reduce glare to lowest level, (3) how to obtain an interesting change of plane in a long series of recessed fixtures, (4) how to attain ease of installation through use of an adjustable mounting, regardless of ceiling thickness, and (5) how to combine reflector and lens for best quality and quantity of light.

Incorporating the new concepts are five new series of more than 100 recessed fixtures in the Illumiline collection. These include the Illumilipse line, as well as the Illumilens, Illumicone, Illumijust, and Illumisphere lines.

One of the new concepts developed is that of the ampliflector. In fixtures utilizing this design, the lower reflector is so sensitively related to the upper reflector that light beams bounce off both, ultimately to be funneled through the aperture with virtually no glare.



Write P-1031 on reply card, p. 19

Early American chandelier

Variations on a popular and admired fixture design of the American Queen Anne period characterize the newest lighting fixture series of the Gill div., Progress Manufacturing Co., Castor Avenue and Tulip St., Philadelphia 34, Pa.

The G 4505 five-light chandelier combines a light and delicate-hued

hand-rubbed pine with the richly satisfying appearance of antique brass. Chain, shades, and swan-curved arms are of antique brass, while the pine predominates otherwise. Downward light is diffused through attractive, technically correct, frosted opal glass. The chandelier width is 22 inches, body height 16 inches, and the over-all height is 42 inches.

Companion pieces include a one-light wall fixture and a one-light ceiling lamp.

Write P-1032 on reply card, p. 19

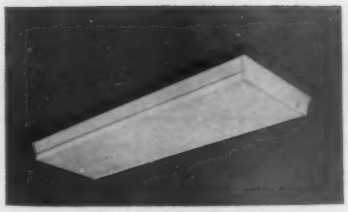
Electro multi-mount fixture

A fixture that can be either recessed, stem mounted, or surface mounted has been introduced by Electro Lighting Corp., 1536 S. Pauling St., Chicago 8, Ill.

The fixture, the Triad, is only 2¾ inches deep. It features a wrap-around low-brightness polystyrene diffuser with prismatic sides that direct a component of light upwards.

Designed for the shallower plenum chambers of modern construction, the recessed depth of the fixture is 1½ inches. In the recessed version the diffuser appears below the ceiling line to wash the ceiling with light and soften contrast. Because of this shallow depth in recessed application it may not be necessary to cut the ceiling furring in many installations. In addition, the shallow depth presents no obstacle to duct and pipe work in the ceiling.

The fixture is modular, designed



to exact even foot lengths. The suspension points for stem and surface mounting are also on even foot centers.

Utilizing 48-inch rapid-start lamps, the Triad is made in two-lamp and four-lamp combinations, and four- and eight-foot lengths. A 24-inch trigger-start version is also available.

Write P-1033 on reply card, p. 19

Jet Line wire pulling unit

Everything needed for fast, safe wire pulling is included in the all-new Jetmaster, recently introduced by Jet Line Products, Inc., 305 Foster Ave., Charlotte, N. C.

Designed for use in wiring any type, any length conduit ½ through four inches in diameter, the Jetmaster combines the separate tools of the Jet Line method into one compact, easily portable unit.

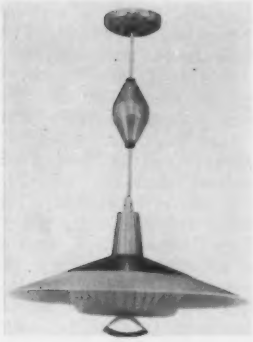
The new unit does the work of the Jet Line gun, cylinder, and underground. All necessary fittings, adapters, and accessories are included, as well as a 500-foot reel of poly rope

and 25-pound—CO_2 tank for power supply. In addition, there is a Jet Line rigid rope for fishing short runs.

Write P-1034 on reply card, p. 19

Emerson 'Trendlighting' line

New fixtures designed to give homes added "emotional appeal" through original styling that utilizes such materials as cased-opal glass, ceramics, and plastics, plus increased emphasis on traditional items, are featured by the new decorative lighting line from Emerson Electric Co.,



Builder Products Group, 8100 Florissant, St. Louis 30, Mo.

Designated "Trendlighting," the new line encompasses 246 highly styled, easy-to-install fixtures for every room in the home, plus outdoors.

Styling and design of every new fixture in the Emerson-Imperial line was arrived at after extensive surveys of home builders, architects and interior decorators.

Typical of the many items that have been added to the line is model No. 1032, a modern 21-inch pulldown in white styrene-plastic capped with a perforated polished brass hood.

Spreader kits are available for all pendant fixtures in the new line. These kits permit clusters of from two to five lights and are adjustable in diameters from 18 to 24 inches.

Write P-1035 on reply card, p. 19

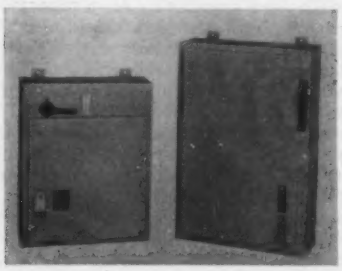
Hoffman 12-panel enclosures

NEMA 12-panel enclosures for mounting the new externally operated disconnect switches are now available from Hoffman Engineering Corp., 9th and Tyler, Anoka, Minn.

A front mounting disconnect means such as the new Square D class 9421 or Westinghouse class 29-120 provides a perfect safety device for control enclosures.

When installed in the Hoffman enclosure the handle is never separated from the disconnect mechanism and can be locked in the "off" position when the door is open or closed. The door is positively latched with a two- or three-point operating mechanism, but a by-pass allows authorized inspection or service in the on position.

The oil- and dust-tight enclosures are formed from 12 or 14 gauge steel



with welded seams and gasketed door. All necessary holes and cutouts in the door and body are made by the factory, so the switch and hardware are easily mounted in the field. The panel and interior of the box are finished with baked white enamel, and the exterior has a gray prime coat over a phosphatized surface. Stock box sizes run from 20 by 20 inches up to 60 by 37 inches in varying depths.

Write P-1036 on reply card, p. 19

Square D limit switch

A new line of type AW oil-tight limit switches, with a two-pole, double-throw snap switch which may eliminate the need for a second limit switch or control relay, is available from Square D Co., Dept. SA, 4041 N. Richards St., Milwaukee 12, Wis.

The new two-pole switch can control up to four circuits. It mounts interchangeably with other type AW limit switches, thereby simplifying installation.

The new switches are offered with

a wide selection of operators including push rods, roller plungers, and roller arms in a variety of lengths and designs. Both flush and surface-mounting devices are available.

Write P-1037 on reply card, p. 19

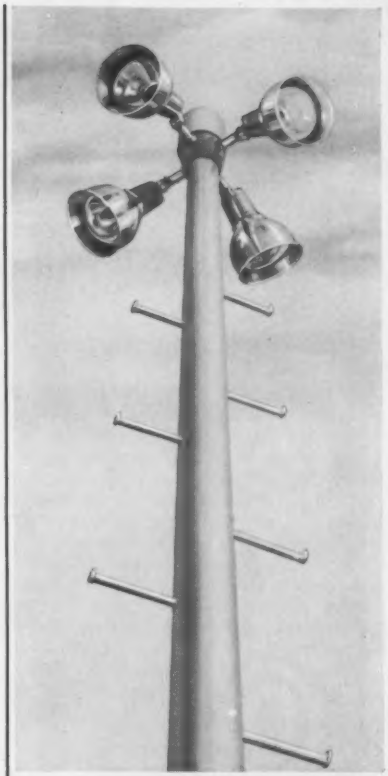
Frink incandescent downlights

A line of incandescent downlights made by the Frink Corp., 211 63rd St., Brooklyn 20, N. Y., is now available from Westinghouse lighting distributors.

Styles include square-frame, round-frame, low-brightness aperture, and eyeball units in sizes from 75 to 300 watts.

The square-frame downlight can be supplied in ratings of 100, 150, or 300 watts. Available shielding includes an Alba-lite 55 lens for even illumination with a wide spread, a Fresnel lens for minimum glare with a medium spread, and a dished opal shield for both down and ceiling illumination.

Round-frame sizes are 75, 100, and



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You are looking at Stonco sealed-beam mercury vapor floodlights.

Hermetically sealed inside each lamp is a brilliant silvered reflector.

The reflector stays brilliant because nothing ever touches it. Not dust, dirt or grime. Not even smoke, soot or chemicals in hazardous areas.

You climb the pole only to change lamps. This could easily be once every five years. Probably longer.

(Conventional floodlight reflectors lose up to 15% efficiency if not cleaned every three months.)

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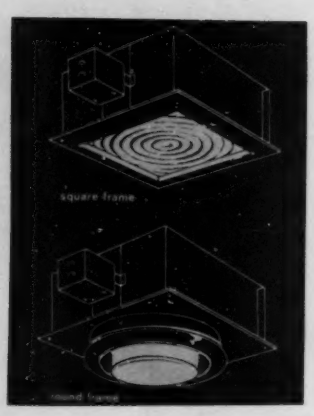


150 watts. Five types of shielding are available, including a dished opal and a Fresnel lens. A two- or three-inch aperture can be supplied where the light source is to be concealed as much as possible, and concentric louvers can be furnished for reduced lamp brightness and a narrow concentrated light beam. No shielding is required if a type R40 reflector lamp is used in the fixture.

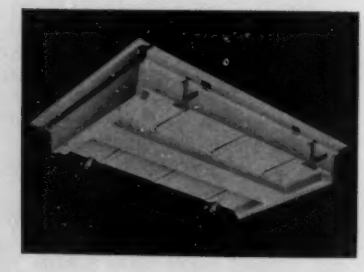
Write P-1038 on reply card, p. 19

Westinghouse luminaires

A new line of recessed commercial fluorescent luminaires, called the Mark II Mainliner, is now available from the Westinghouse Lighting Div., Edgewater Park, Cleveland, Ohio.

The new luminaires were specially designed to assure accurate dimensions, high strength, and easy installation.

The types of luminaires offered are



wide flange, grid, and T-bar. With each type there is a choice of louver, diffuser, or lens shielding. Depending on the choice of shielding, available materials include glass, metal, or plastic.

Sizes range in width from one to four feet, and in length from two to eight feet. Round fixtures are available with two-, three-, and four-foot diameters.

Write P-1039 on reply card, p. 19

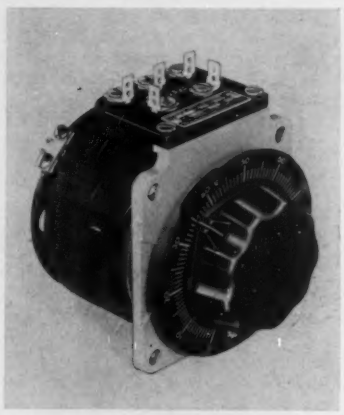
Superior variable transformer

A new, compact 50/60 cycle Powerstat variable transformer series having output ratings up to 3.75 amperes with constant current loads and up to 5.5 amperes with constant impedance loads has been introduced by Superior Electric Co., 83 Laurel St., Bristol, Conn.

Called the 21 series, these new Powerstats feature several design innovations: gold alloy plated commutator, functionally designed terminal arrangement for connection flexibility, terminal adapters for either soldered connections or push-on connectors, adjustable 3/8-inch solid metal shaft, square base design for increased strength, and reduced overall height and space behind panel.

Other inherent characteristics include zero waveform distortion, high efficiency, excellent regulation, linear output voltage, smooth control, moderate temperature rise, and rugged mechanical construction.

Single-, two-, and three-gang man-



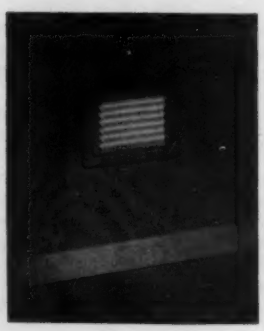
ually operated or motor-driven single- and three-phase models are available.

Write P-1040 on reply card, p. 19

Long-life night light

A new night light using a small fluorescent lamp that lasts up to six times as long as its incandescent counterpart in normal use is being introduced by Day-Brite Lighting, Inc., 6260 N. Broadway, St. Louis 15, Mo.

Called the "Fluorescent Nite Light," the new product—when used an average ten straight hours a day—will light up to 21 months (6,000 hours) before the standard four-watt, six-inch fluorescent lamp needs to



be replaced. Using a standard 25-watt incandescent bulb, a change would be needed approximately every 3-1/3 months (1,000 hours).

The light has a louvered face and is recessed into the wall. When the lamp does need changing, a single thumbscrew on the face of the unit is loosened, and the louvered face drops down on a separable hinge. A new lamp is then easily substituted.

Included among uses for the light would be office buildings, theaters, hospitals, hotels, motels, restaurants, factories, retail establishments, etc.

Write P-1041 on reply card, p. 19

New product briefs

New contemporary **white opal luminaires** recently announced by **Stonco Electric Products Co.**, 333 Monroe Ave., Kenilworth, N.J., are designed for all outdoor or indoor locations requiring soft, luminous effects from a decorative severe-service fixture. Fixtures can be used with 100-, 150-, or 200-watt lamps. All fixtures are precision die-cast aluminum, fully gasketed, and sealed for positive weatherproof performance in rain or sleet.

Write P-1042 on reply card, p. 19

Individual housings that accommodate a wide variety of fronts, a new simplified numbering system, and faster, easier installation are features of an expanded line of **recessed lighting fixtures** for residential and commercial applications available from **Emerson Electric Co.**, 8100 Florissant, St. Louis 36, Mo. Designated S-R-O (square—round—oblong) the new line comprises 13 housings and 36 different fronts including flat and drop bowl lenses, louvered, conical, skirted, eyeball, pinhole, and adjustable spot. Faster installation of these new fixtures is possible through use of slip straps with built-in nail prongs furnished with two models. These permit nailing directly to studding.

Write P-1043 on reply card, p. 19

A new **wraparound fluorescent lighting fixture** built for surface mounting, in either individual or continuous row patterns, has been announced by **Sylvania Electric Products, Inc.**, P. O. Box 831, Wheeling, W. Va. The new Stylus fixture, No. W-2404, is designed in shallow modern styling to combine lighting efficiency with eye comfort. A wraparound plastic lens provides shielding. The fixture carries a totally enclosed steel top plate, and return end caps provide a finished appearance and prevent light leak from the ends. No-drip CBM ballasts are featured in the new fixture. Silver-plated lampholder contacts assure positive lamp starting. The fixture is painted in a durable all-white baked enamel finish. The whole unit is U.L. listed.

Write P-1044 on reply card, p. 19

Users of the new Styrex **lighting diffusers** from **Lightonics,** P. O. Box 7211, Oakland 1, Calif., are guaranteed in writing against objectionable discoloration for 50,000 hours (or 15 years) of normal use. In addition, the Styrex crisp white panels have high efficiency with over 50 per cent transmission. The high impact resistant material has over three to four times the izod impact strength of vinyl.

Write P-1045 on reply card, p. 19

A new line of **outdoor lighting fixtures** featuring six ultra-high-output type, 1,500-ma lamps is now available from the **Guardian Light Co.,** 500 North Blvd., Oak Park, Ill. The fixture provides one of the highest light outputs of any single unit now on the market. Dimensions are 3¾ inches high and four, six, or eight feet long. Featured is a hinged door assembly constructed of anodized aluminum extrusions and .100 thick clear acrylic plastic.

Polyurethane gasketing completely seals out dirt and insects.

Write P-1046 on reply card, p. 19

A portable **lighting fixture washing machine** marketed by **Wash-A-Matic Co.,** 369 W. Portal, San Francisco 27, Calif., is designed to save as much as one-third of the usual man-hours required for cleaning louvers. The machine can wash up to 15 louvers per minute. It automatically applies the wetting agent, detergent, brushing, rinse spray, and destaticizer to luminous ceiling panels and fluorescent fixture diffusers.

Write P-1047 on reply card, p. 19

One of the first four-stage **light controls** fitting into a standard wall box has been announced by **Lutron Electronics Co.,** 230 5th Ave., New York 10, N. Y. The Dimitron can be installed quickly without special construction or knocking out of walls. Operation of the control is based on an exclusive electronic principle from space-age technology. Full lighting range may be dialed within a convenient one-quarter turn; off, 20 per cent, 50 per cent, and 100 per cent illumination. The exterior of the Dimitron is in gleaming gold and cream-beige.

Write P-1048 on reply card, p. 19

Textur-Cel, newest addition to the **textured aluminum louvered ceiling** group from **Neo-Ray Products, Inc.,** 315 E. 22nd St., New York 10, N.Y, is now on the market. This ceiling, textured in a Grecian key design, couples highly efficient illumination and very low brightness. For use in systems employing the Tee-Track suspension or the Intra-Cel trackless, unbroken pattern system, the panels come in two- by two-, two- by four-, three- by three-, or four- by four-foot sizes, in baked white enamel, natural, or gold anodized finish.

Write P-1049 on reply card, p. 19

DURABILITY

The "SCOTCH" Brand Electrical Tape No. 33 used to wrap the cable on this portable welder provides excellent protection against wear and abrasion. Seals out dirt and moisture, provides an electrically sound insulation barrier that lasts for years. The cost of such durability? Only a few pennies. When tape costs so little, can you afford less than the best?

BALANCED FORMULA IS THE SECRET: Whatever the task, you can depend on "SCOTCH" Brand Electrical Tape No. 33. Its perfect balance of physical properties provides the ultimate in holding, protecting and insulating all in one wrap. Strong, stretchy, it has the perfect "feel" to get jobs done faster, done right. Tough vinyl backing shrugs off moisture, sunlight, heat, cold and other adverse conditions. Pressure-sensitive adhesive adheres instantly, holds permanently, without creeping or end-lifting. Low power-factor provides excellent insulation . . . high electric strength, wet or dry. For every job you can put your confidence in "SCOTCH" Brand Electrical Tape No. 33.

FIRST and still the best

Minnesota Mining and Manufacturing Company ...where research is the key to tomorrow 3M

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For more details on above items, use reply card on page 19

Technical books

for the electrical man

Photography reference

"Focal Encyclopedia of Photography," Desk Edition. Published by the Macmillan Co., 60 Fifth Ave., New York 11, N. Y., 1,200 pages, illustrated, $6.95.

One of the most complete one-volume photographic references now available, this book contains 1,500 diagrams, and covers 2,000 subjects and 14 major fields relating to photography.

Some 197 contributors added knowledge to the work, with ten editors and 50 consultants from 23 countries.

Definitions and equipment are covered thoroughly. Slang, working term usage, technical and art terms, as well as abbreviations and measuring units are covered under definitions. Types of materials and results are discussed for cameras, accessories, film, and developing equipment. More than 200 tables are included, covering everything from lenses and focusing to comparative evaluations.

Subject matter, methods of picture making, and methods of developing are discussed in detail.

Specialized photography is also included, with sections on scientific photography, press photos, and law photography.

The history and development of photography is also given, along with biographies of outstanding men in the field.

Computer basics

"ABC's of Computers," by Allan Lytel. Published by Howard W. Sams and Co., Inc., 1720 E. 38th St., Indianapolis 6, Ind., 128 pages, $1.95.

This book has been written to serve as a basic, self-teaching introduction to the fascinating subject of electronic computers.

It explains in simple, easy-to-understand language what computers are, how they operate, and what they can be expected to do.

It is as applicable to the interested layman, hobbyist, or student as it is to the electronic technician who wants an over-all understanding of modern computers.

Based in part on the author's teaching experiences at Temple University Technical Institute & Community College, and at International Business Machines, the book describes the two basic computer types —digital and analog. In logical progression it discusses circuits, tube and relay switching devices, and solid-state circuit devices such as transistors, diodes, photoelectric components, magnetics, etc.

The book then proceeds to explanations of numbers for computers (including discussions of various numbering systems and binary notation), arithmetic operation, octal numbering, numbering codes, symbolic logic, and basic logical circuits.

Counters (binary, decade, and ring types) are next discussed, followed by calculating circuits, numbering representation, comparison circuits, etc. Information storage is covered in a separate chapter, as are input-output devices, including analog to digital conversion.

The final chapter fully discusses programming, computer instructions, etc.

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TRANSFORMER HANGERS
● Thiel Hangers are made to NEMA specifications. Heavy gauge steel construction, hot-dip galvanized for dependable service and long life. Two styles complete with galvanized bolts and nuts stocked for immediate shipment
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Transformer 75-100 KVA Single-Phase 75-112½ KVA Three-Phase
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Two sizes, for 3-50 KVA 1-Phase and 9-45 KVA 3-Phase transformers.
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Dead End Primary at Pole. Withstands 3,000# load maximum. Uses a minimum of space on pole.
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Hi-fi and stereo manual

"Hi-Fi—Stereo Handbook," Revised Edition, by William F. Boyce. Published by Howard W. Sams and Co., Inc., 1720 E. 38th St., Indianapolis 6, Ind., 288 pages, $3.95.

Written especially as a reference and guide for all persons interested in a suitable sound reproduction system, the book contains valuable data for both the experienced audiophile and the beginner.

In addition to supplying information which will help in planning, selecting, and installing appropriate systems, it also describes the various system components, plus what they do and how they operate.

It explains the difference between monophonic and stereophonic sound systems, the meaning of high fidelity, the different sources of program material, the various kinds of distortion, etc.

Numerous diagrams and photos of equipment setups are included throughout the book.

Included in the eight chapters are such topics as monophonic and stereophonic sound, fidelity, sound and distortion, stereo techniques, program source equipment, amplification and control, loudspeakers, loudspeaker baffles and enclosures, plus systems design, selection, and installation.

Helpful literature

available to our readers

Seven individual bulletins, collected in tabular form in their new catalog, describe and illustrate the line of **commercial incandescent lighting** from **Art Metal Lighting Div., Wakefield Corp.,** 1814 E. 40th St., Cleveland 3, Ohio. The catalog, 76 pages in all, includes full description of a complete line of prismatic lens units, along with light distribution curves and coefficient of utilization tables.
Write B-1050 on reply card, p. 19

The new multi-purpose Generalflood line of **floodlights** is diagramed and described in illustrated bulletin No. GF-860, from **Appleton Electric Co.,** 1701-1759 Wellington Ave., Chicago 13, Ill. Eight models are covered in the bulletin, plus accessories
Write B-1051 on reply card, p. 19

Bulletin No. SF-960, covering the Intenso Sportoflood **floodlight line,** is now available from **Appleton Electric Co.,** 1701-1759 Wellington Ave., Chicago 13, Ill. Complete with diagrams, illustrations, and charts, the bulletin gives detailed specifications for six Sportoflood models and accessories.
Write B-1052 on reply card, p. 19

"Light-Forms," glowing geometric shapes which are hexagonal, round, square, and rectangular, and which combine Thermopal glass with all-aluminum construction, are described in catalog No. LF-1 available from **Prescolite Manufacturing Corp.,** 2229 Fourth St., Berkeley, Calif. The **glass fixture forms** described are suitable for individual fixtures or grouping.
Write B-1053 on reply card, p. 19

A bulletin on the new 1,500-watt Intenso **Quartzlite floodlights** is available from **Appleton Electric Co.,** 1701-1759 Wellington Ave., Chicago 13, Ill. Complete specifications of the weatherproof lamp are included in the illustrated booklet, No. QL 15-161, with diagrams and charts showing details.
Write B-1054 on reply card, p. 19

A four-page brochure on **floor boxes** from **Thomas & Betts Co.,** 36 Butler St., Elizabeth, N. J., lists a new line of adjustable under-floor boxes and accessories for shallow and normal fill floors. The line described in brochure No. F13-144 includes a large capacity box which accepts up to 1¼-inch conduit.
Write B-1055 on reply card, p. 19

Booklet B-8235, describing the Mark II Mainliner, a new line of **commercial recessed fluorescent luminaires,** is now available from the **Westinghouse Lighting Div.,** Edgewater Park, Cleveland, Ohio. The well illustrated ten-page publication points out the unique construction of the new fixture and the many style combinations offered.
Write B-1056 on reply card, p. 19

Just released is a 16-page **industrial lighting** catalog of **Radiant Lamp Corp.,** 300 Jelliff Ave., Newark, N. J. One hundred sixteen different types of hard glass industrial incandescent and mercury reflector lamps for indoor and outdoor lighting are featured, with lamp types and voltages to meet standard and special requirements for industry, from 50 to 10,000 watts. In a new approach to industrial lighting, this illustrated catalog is designed as a guide for buyers of industrial lamps

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1. Die formed. 2. Not less than 20 gauge, prime, cold rolled steel. 3. ELECTROSTATICALLY painted. 4. HPF ballasts, U.L. listed, E.T.L. and C.B.M. approved. 5. Two and four lamp models. 6. Rows, flush or pendant installation. 7 Extremely shallow, 8 indented end-plates for light-seal. 9 Lamp and reflector location provide high efficiency illumination the E. T. L. reports; 10 low brightness, 11 even light distribution, 12 no shadows, 13 no visible lamp-lines. 14 Slide-out lamp holders and 15 fused circuit. 16 Ventilated snap-in cover provides; 17 longer ballast life, 18 eliminates vibration hum, 19 removes without tools for faster installation, 20 diffuser, extruded polystyrene with optical properties the E. T. L. reports, 21 one-piece wrap-around 22 locks in to prevent accidental fall-out 23 deluxe appearance at low cost.

Excerpt from Electrical Contractor's unsolicited report . . . Letter of 4/10/61

. . . Our workmen advise that never have they installed any fixtures with so many features to aid them in installation; and we, needless to say, are happy to hear of advantages like this that can affect our cost.

Sincerely,
Clarence Grimm Electric Co., Inc.
H. W. Jasper, Estimating Eng.

STA-BRITE Fluorescent Mfg. Co.
3550 N. W. 49th STREET • MIAMI, FLORIDA

STA-BRITE PRISMA® WRA-2/40rs-4/40rs ETL

DESCRIPTIVE LITERATURE SENT UPON REQUEST

in specifying the lamp that exactly fits the particular use to which it will be put.

Write B-1057 on reply card, p. 19

Selection and installation of the right section, type of bend, or component part for supporting power cables, communication cables, and automatic control or hydraulic line cables is covered by the new 52-page booklet, No. 106, on **cable support systems** from **Chalfant Products Co., Inc.,** 11525 Madison Ave., Cleveland 2, Ohio.

Write B-1058 on reply card, p. 19

The new "Area Lighting Designer's and Buyer's Guide," a comprehensive presentation of all luminaires, controls, poles, brackets, and hardware associated with G-E **area lighting,** is now available from **General Electric Co.,** 1 River Rd., Schenectady 5, N. Y. The guide spells out application data, gives illustrations and installation recommendations, and provides proper footcandle levels and how to achieve them.

Write B-1059 on reply card, p. 19

A new **residential lighting** catalog, No. 161, showing advanced ideas in lighting the home, is now available from **White Lighting Co.,** 5221 W. Jefferson Blvd., Los Angeles 16, Calif.

Write B-1060 on reply card, p. 19

An **infrared heating** design manual compiled to assist in the planning of infrared heating and lighting installations is available from **Luminator, Inc.,** 120 N. Peoria St., Chicago 80, Ill.

Write B-1061 on reply card, p. 19

A new line of **incandescent downlights** being made for Westinghouse by the Frink Corporation is described in a 12-page catalog available from **Frink Corp.,** 211 63rd St., Brooklyn 20, N. Y. Features and application data for square, round, eyeball, and low-brightness aperture styles in 75- to 300-watt sizes are listed.

Write B-1062 on reply card, p. 19

A 16-page booklet on the applications and selection of **high-voltage power fuses** is now offered by the **Westinghouse Electric Corp.,** P. O. Box 2099, Pittsburgh 30, Pa. The publication is a comprehensive guide for selecting the power fuse best suited to various applications such as transformer and motor protection. The three principal types of fuses discussed are refill power fuses, drop-out power fuses, and current limiting power fuses. Also, the booklet contains information on their interrupting ability, continuous current ratings, and melting characteristics.

Write B-1063 on reply card, p. 19

The **Moe Light Div., Thomas Industries, Inc.,** 207 E. Broadway, Louisville 2, Ky., has issued a specialized eight-page catalog on decorative **drum lighting** fixtures to introduce its new series of flare-shaped drums. Fixtures covered are designed as a decorative utility light for the home and a contemporary fixture for commercial uses in offices, schools, and institutions.

Write B-1064 on reply card, p. 19

Catalog supplement No. 611-A, from **Sherman and Reilly, Inc.,** 1st and Broad Sts., Chattanooga 2, Tenn., covers an entirely new method for installation of spacer type aerial cable. The new concept, the **continuous stringing system,** enables uninterrupted stringing from start to finish. This brochure includes complete specifications and pictures of an actual installation along with step-by-step explanation.

Write B-1065 on reply card, p. 19

Transite **conduit** types I and II are completely described in the new brochure, TR-247A, from **Johns-Manville,** Pipe Div., 22 E. 40th St., New York 16, N. Y. The 12-page brochure contains considerable reference data of use to designers, specifiers, and purchasers of electrical duct. A handy table lists the most important conduit requirements and the accompanying properties and performance factors of Transite conduit.

Write B-1066 on reply card, p. 19

A complete 20-page brochure on the subject of **combination air-handling troffers** is available from **Sylvania Electric Products, Inc.,** 1 48th St., Wheeling, W. Va. The brochure contains many illustrations and technical information in the form of tables and charts covering photometric and air distribution data, plus specification details.

Write B-1067 on reply card, p. 19

A booklet describing the new sealed-beam lamp **floodlight** series called "PAR-beam" is available from **Crouse-Hinds Co.,** Wolf and 7th North Sts., Syracuse 1, N. Y. The literature covers models accommodating lamp sizes from 75 to 500 watts, for utility, protection, and decoration.

Write B-1068 on reply card, p. 19

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"SNAPER" STRAPS
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THE SNAPPER

SNAP ON—STAY ON

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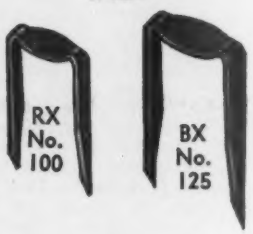

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The 4000-SZ series, "Astro-Dial" **time controls,** with "follow-the-sun" operation, are completely described with typical uses, features, complete specifications, enclosure dimensions, and suggested wiring diagrams in a two-page, two-color bulletin No. 6022, available from Department L, **Paragon Electric Co., Inc.,** 1618 12th St., Two Rivers, Wis.

Write B-1069 on reply card, p. 19

Maintenance, safety, and production equipment is pictured and described in a 64-page catalog from **Martindale Electric Co.,** 1375 Hird Ave., Cleveland 7, Ohio. Buying data covering 110 different products is included. The catalog contains dimensional drawings, how-to-use-it photographs, and complete prices. It comprises a ready reference source book.

Write B-1070 on reply card, p. 19

A switch catalog from **Guardian Electric Manufacturing Co.,** 1550 Carroll Ave., Chicago 7, Ill., provides 16 pages of quick reference information covering a wide variety of **switches.** The featured switches are of basic design and suggest additional combinations available as standard or custom-built switches. Complete dimensional drawings of switch components are included in this catalog, "E".

Write B-1071 on reply card, p. 19

Litecraft Manufacturing Corp., 100 Dayton Ave., Passaic, N. J., has released a 16-page illustrated brochure featuring the company's new Endura series of finely engineered **incandescent lighting fixtures** for commercial, institutional, and residential uses. The booklet has illustrations, diagrams, descriptions, and specifications for each of the series, including recessed squares, Alzak darklights, baffled downlights, adjustable accent lights, and recessed ground regressed lens lights.

Write B-1072 on reply card, p. 19

A 16-page illustrated "Manual of Fluorescent Lamp Ballasts" has been published by the **Universal Manufacturing Corp.,** 29-51 E. 6th St., Paterson, N. J. The handbook features a special section on the operation and care of **fluorescent ballasts.** It also contains a description of the various types of ballasts—their design, construction, and application.

Write B-1073 on reply card, p. 19

Catalog No. 20, in full color, from **Emerson Electric Co.,** 8100 Florissant Ave., St. Louis 36, Mo., covers the company's Imperial lighting line of **residential fixtures.** Illustrated and complete with details, the 68-page catalog covers a wide variety of fixtures, ranging from contemporary chandeliers to early American lamps, and from recessed fixtures to outdoor post lights.

Write B-1074 on reply card, p. 19

KILLARK LIGHTING FOR HAZARDOUS OR EXPOSED LOCATIONS

EXPLOSION-PROOF
For Class 1, Groups C and D. Class 2, Groups E, F, G installations. 60 to 500 W annealed globe.

DUST-TIGHT
For Class 2, Groups E, F, G hazardous locations. Sealed light, burns cool.

VAPOR-TIGHT
Indoor or outdoor installation. Positively weatherproof. 60 to 500 W.

MUSHROOM ISLAND LIGHT
For service stations, parking lots, etc. Basic island light, plus 1 to 5 sealed beam spot lights.

FLOOD LIGHT
Weatherproof in any position. Styles for PAR-56 and PAR-64 sealed beam lamps.

SEALED BEAM LIGHT
Single or cluster styles, adjustable mountings. PAR-38 and R-40 lamp styles.

LOUVER LIGHT
For steps, passageways, small sign. Easy to install.

CONCH LIGHT
Indoor or outdoor. Fleur-de-lis design. With or without switch.

DEKORATIVE LIGHT
Attractive styling; pendant or ceiling, frosted or clear globe.

Complete safety is skillfully engineered into these fixtures, and durability, too. Because they're cast from aluminum, they never rust, dissipate heat faster than other metals, will not spark. Efficient design; most fixtures have interchangeable parts. Sold through wholesalers from coast to coast and in Canada. Warehouse stocks in 18 cities.

Killark

Write for Killark Lighting Catalogue

ELECTRIC MANUFACTURING COMPANY

Vandeventer and Easton Aves. • St. Louis 13, Mo. 6110

In Canada: Killark Electric of Canada, Ltd., 421 Islington Ave. South, Toronto 18, Ont.

"Design and Application of Holophane Prismatic **Street Lighting Refractors,**" from **Holophane Co., Inc.,** 342 Madison Ave., New York 17, N. Y., is a 24-page booklet now available to city engineers, superintendents, public works departments, utilities, and consulting engineers. The illustrated book presents design considerations and application information based on years of field experience.

Write B-1075 on reply card, p. 19

Lighting for gardens, patios, pools, shrubs, sidewalks, and driveways is illustrated in a brochure published by **Steber Div., Pyle-National Co.,** 2700 Roosevelt Rd., Broadview, Ill. The well-organized literature includes complete description and prices for a wide choice of portable **yard lighting** types ready for use.

Write B-1076 on reply card, p. 19

Bulletin GEA-7222, from **General Electric Co.,** 1 River Rd., Schenectady 5, N. Y., describes the company's integral **distribution centers** with liquid-filled transformers, 112½ kva and above (oil or Pyranol), and dry type transformers, 300 kva and above. This booklet provides data on four incoming sections, three transformer sections, and a choice of low-voltage equipment.

Write B-1077 on reply card, p. 19

Spot network relaying

(Continued from page 94)

if a breaker should be tripped by the network relays, as automatic reclosing would follow as soon as conditions returned to normal.

As far as we can determine, the only contingency which we have not provided for is the failure of a high-voltage power fuse. If one of these should open without a fault occurring, it would leave one of the transformers single phasing with double load on that phase of the remaining transformer. Indicating ammeters are installed on the low side of the transformers so that this condition would be discovered during a periodic station check.

From our experience in installing this vault, we see no objection to accepting other loads of this type if the location and size is such that it can be done economically.

Transmission towers

(Continued from page 98)

fabricated by Muskogee Iron Works, Muskogee, Okla. Thirty-three of the towers were tangent structures; the balance consisted of five other types.

Conductors for the Meramec-Lemay line were supplied by Alcoa's Rome Cable Div. Main portion of the line employs 954 MCM 54/7 ACSR; 954 MCM 30/19 ACSR is used for river crossing sections.

Unique church

(Continued from page 57)

We used conventional concrete boxes, and we had to keep the boxes exactly in line on the two pours. A little shift could throw them all out of line, and the interior lights these were to feed had to be perfectly placed.

There was no leeway on this job. It took a lot of advance planning on pipe runs because they had to go exactly. And since we had no previous experience or labor units on a job of this sort to go by, we had to make very careful estimates.

Rigid conduit in ½-inch and ¾-inch sizes was used in the poured concrete walls and in the shell roof of low-slump, blown-on concrete.

Eight hanging fixtures were used in the sanctuary proper—six-

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Atlanta 9, Georgia

foot pendants, each with two 150-watt WR40 lamps. Four of the same lamps, except with shorter pendants, were used in the balcony. In the sacristy area, four wall-mounted lights were used, each 150 watts; and in the ceiling, twin 150-watt WR40s on a six-foot pendant were installed.

Tall scaffolding was necessary to work on the ceiling wiring and fixtures. Wires came out of the box in a 45-degree angle fitting and then into a union. And at this point another new system for us was tried which worked out quite successfully, with good appearance.

The ceiling finish on the shell roof was of a sprayed asbestos material. We molded the asbestos material by hand to a cone where the fixtures joined.

In other interior details, five hearing aid openings were placed in the floor for plug-in use of headphones, and a speaker and receptacle were placed in the base of the wall.

A dimmer panel was placed under the box at the rear of the sanctuary, under the balcony, near the entrance for full control of light intensity in the sanctuary. Sanctuary lighting is on six circuits.

In the clean-lined angular structure of spotless white appearance and with a built-up white thermal roof, use of a mast would have been unsightly.

The panel was placed in a mechanical room to one side of the church. The pipe was run right on the roof of this and then to the pole. Plenty of panel and service capacity were provided for future additions. A four-inch pipe with a 400-ampere, three-phase main was used for the new sanctuary.

A special kind of receptacle was provided for outside ground floodlighting of the church entrance. Two poured concrete receptacles echo the pattern and angles of the church design. In these are used PAR 300 Pyrex lights.

A structure of three tall, slender crosses forms a tower to one side of the church entrance, and conduit was run to a single light at the top of this tower where a weatherproof receptacle was placed.

Architect Scott and Lippert Brothers Construction Company have produced a building with some new concepts which keeps a traditional air the congregation wanted. We were pleased to have done the electrical work.

Although we had to be on the

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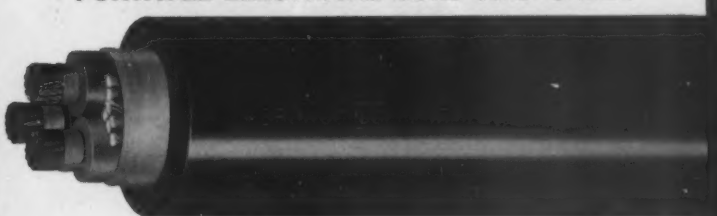

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job a lot more during the pouring than on normal jobs, and the nature of the work called for more planning and precision, these things were taken into consideration at the beginning. The job has worked out well for us.

Underground service

(Continued from page 89)

fiber conduit required under public roadways outside of the subdivision area.

(2) Install all required pad-mounted transformers.

(3) Install and connect all primary and secondary distribution cables.

(4) Connect all customers' service cables to the company transformers or cables in service handholes.

Before beginning the actual installation in the field, it is very beneficial to hold a joint meeting at the construction site with representatives of the developer, his contractor, our underground construction and engineering departments, and the local telephone company.

At this time, the entire easement can be checked to determine the amount of grading and clearing necessary and agreement can be reached on the starting point and the coordination of the work that is mutually satisfactory. Usually the installation of the electric facilities is completed before the telephone company begins its construction.

Our construction experience with this type of installation, while not extensive to date, generally has been satisfactory. We have had some difficulties and expect that more will occur. The main problem has been coordination of the cable installation with the contractors' trenching operations, which is particularly critical during bad weather.

Thus, it is very important that the easement be cleared ahead of the trenching operation to avoid delays and also that the contractor have equipment capable of performing the operation without excessive breakdown. We are also considering methods of speeding up the cable installation to facilitate closer working arrangements with the contractor.

One change from our present practice which would alleviate the above problem to some extent would be to bring the primary cable up into the transformer pad instead of burying it around the pad. This would result in being able to install shorter lengths of cable and thus require fewer men to handle it.

A test cap type joint would be required at each pad with a temporary housing but it would eliminate having to dig up the cable around the pad and bring it up into the transformer at a later date. This is being investigated and a field trial is planned for the next installation.

We realize that we are still in the development stage with this new type of construction and at present it is only a very small portion of our total construction work load.

However, considering that we had installed underground service to only one subdivision in the four years prior to 1960 with our previous design and then in 1960 to have seven projects of this type develop, we believe it is a definite indication of the acceptance of this new system and revised methods of construction.

Thus we are very optimistic about the future application of underground distribution systems.

Apartment lighting

(Continued from page 54)

ment of G-16½ lamps mounted in a decorative wood molding.

The lighting fixtures in the living room attached to the brass finished light span are 50-watt R-30 lamps in white exterior, black interior metal cylinders. Each metal cylinder is about eight inches long, and the use of spacers allows the same lamp to create a spot or flood effect.

One battery of lamps on a light span controls the intensity on the soroban screen to permit or exclude a view of the planting area (in the dining area) from the living room.

Code application

(Continued from page 64)

or be of the totally enclosed type unless equipped with guards or screens to prevent the escape of arcs, sparks, or hot particles.

This distance (12 feet) is the same whether hot incandescent lamps are used or whether relatively cool fluorescent lamps are used. In either case, hot particles should have cooled to a safe temperature after having fallen a

distance of 12 feet so that volatile gases or liquids on or near the floor will not be ignited by them.

Lampholders and fixtures which are not over areas which are normally used for vehicle traffic and which are not otherwise subject to physical damage are not required to be so protected by height or by screens or other enclosures.

Portable lamps and lampholders are required by Paragraph (c) to be of the unswitched type and of the type which does *not* provide plug-in facilities. Such a portable lamp must have a handle, a hook, and a guard. Exterior surfaces which are likely to come in contact with battery terminals and similar objects are required to be of non-conducting material unless effectively insulated.

Lampholder shells are required to be of molded composition or similar approved non-conducting material. Metal-shell lampholders are prohibited. Portable lamps must be so supported that they will not reach down to the hazardous area unless of the type approved for Class I locations.

Battery chargers and their control equipment as well as batteries being charged are prohibited by Section 511-7 from being located within hazardous areas of commercial garages.

Electric vehicle charging is permitted in commercial garages by Section 511-8 provided that the following rules are complied with:

(1) Flexible cords used for supplying the charging current must have a current-carrying capacity which is adequate for the purpose and be of a type which is approved for extra-hard usage suitable for the purpose.

(2) Connectors are required to have current ratings at least equal to the current-carrying capacity of the cord and in no case less than a 50-ampere rating. Such connectors are required to be so designed and installed that they will break apart readily at any position. Live parts must be guarded against contact. Connectors are not permitted to be within hazardous areas.

(3) Where plug type connectors are provided for direct connection to electric vehicles, the point of connection is not permitted to be within hazardous areas. Where cords supplying such plug type connectors are suspended from overhead, no point along the cord is permitted to reach within less than six inches of the floor.

(The connector itself, as mentioned above, cannot be within the hazardous area and therefore not within 18 inches of the floor.)

Where vehicles are equipped with approved plugs of this type which will readily pull apart and which are provided with automatic take-up reels or other means of lifting the cord and plug out of the way of possible physical damage, no other connectors in the cord or at the outlet are required.

Article 512 of the Code governs residential storage garages. A residential storage garage is defined by Section 512-1 as "...a building or room in which not more than three [self-propelled vehicles of the type which utilize flammable liquids or gases for fuel] are or may be stored, but which will *not normally* be used for other than *minor* service or repair operations on such stored vehicles."

Italics have been added to point up the slight hedging permitted by this section so as to permit some repairs to stored vehicles.

(Section 511-1, it will be remembered, classifies any location where repairs are made to such vehicles as a commercial garage.)

The amount of repairs which are permitted by Section 512-1 in a residential storage garage without its being reclassified as a commercial garage are—well—"minor." The use of the word *normally,* however, leaves no doubt that a location where repairs are normally made is to be classified as a commercial garage.

No part of a residential storage garage is classified as a hazardous area provided that both of the following conditions are met: (1) "where the lowest floor is at or above adjacent ground or driveway level," and (2) "where there is at least one outside door at or below floor level."

The outside door cannot have a curb, not even a sloping drive-over curb which could confine or cause the accumulation of gasoline vapors.

Where the lowest floor is below adjacent ground or driveway level, the residential storage garage then must comply with the rules of a commercial garage. This includes wiring above as well as in the hazardous areas.

The term *lowest floor* could refer not only to a two- or three-story garage, but also to a garage having all vehicle spaces side by

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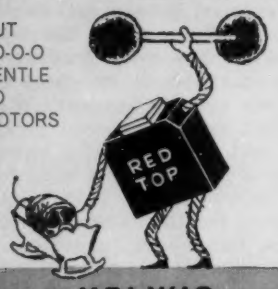

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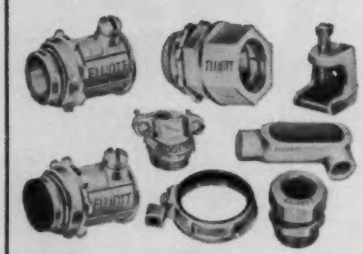

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side but where each space, because of terrain, is placed slightly but progressively lower as the grade descends.

In the latter case, the lowest floor, if not all floors, would usually be below the adjacent grade level.

Answers to Code test questions: (1. **T** Section 511-1) (2. **F** Section 511-2-a) (3. **T** Section 511-2-b) (4. **F** Section 511-2-c) (5. **F** Section 511-4) (6. **b** Section 511-5-a) (7. **a** Section 511-5-b) (8. **b** Section 511-5-c) (9. **c** Section 511-5-e) (10. **c** Section 511-6-a).

'Room of Tomorrow'

(Continued from page 50)

Another daring innovation introduced by designer Emily Malino was the grouping of multi-grooved recessed downlights to illuminate a change of level in the steps leading into the living-dining area, and at the same time lighting up the plants and greenery that are part of the decorative scheme.

At the other end of the room is a handsome pulley fixture with a translucent wood shade. In another corner is a new wall lamp on a pantograph arm—ideal for the salesman who has to write midnight orders and reports.

In the bath-dressing room, a 13-foot length of modular lights over the mirror offers the same candid custom-lighting of a stage star's dressing room to permit perfect light for a woman's make-up or a man's shaving.

For the terrace-deck, there are two lights: a recessed fixture on the ceiling, and on the floor a low-level outdoor lamp. The latter is an adaptation of a Japanese stone lantern with large scale perforated metal and a bright red band.

While the decorative motif in the "Room of Tomorrow" is very much in evidence, easy maintenance was another important factor considered. The lamps and fixtures are constructed out of such easy to care for materials as precision molded plastic and anodized aluminum.

In addition, the surface and recessed fixtures are equipped with a relamping mechanism to speed the work of changing bulbs. The diffusing enclosure of the fixture is pulled down and remains safely suspended, leaving both hands free to change bulbs or clean the surface.

The "Room of Tomorrow" will be a stellar feature of the hotel exposition and will be shown also at the Mid-West International Hotel Show to be held in Chicago in February, 1962.

Office building

(Continued from page 42)

of the heat from the lighting equipment.

The return air with the heat it has picked up from the lighting fixtures is brought back to the air handling equipment on each floor and then fed into the hot air duct system where it is reused if the system is calling for additional heating, or it is exhausted to the outside if no additional heat is needed, or rechilled as mentioned previously, or some of each.

The system is designed to introduce outside air automatically when the temperature and humidity are favorable, thus reducing the operation of the air cooling equipment when low temperature air is available outside.

In winter the cold outside air is often sufficient to cool the interior offices, and the heated air drawn from above the lighting fixtures is sufficient to heat the exterior offices.

During the summer all offices need to be cooled, and the warm air drawn from above the lighting fixtures is simply exhausted to the outside.

The total electric load in this 22-story building is 8,000 kw — approximately 23 watts per square foot. The service voltage is 266/460 supplied through 16 parallel sets of 500 MCM cables and two 4,000-ampere main circuit breakers.

An underfloor duct system, utilizing Walker Brothers equipment, extends throughout the entire office floor area, making incidental power and telephone outlets accessible at any desk location.

Traditional home

(Continued from page 48)

of the kitchen, a black birdcage metal hanging fixture over the dinette; and in the den, a play of lighting for many moods of relaxation.

Lighting controls are placed at each of two entrances to the den. In the den also in one of four panels for AM-FM radio and intercom controls. The main panel for this unit is on the kitchen wall beside the entrance to the dining room.

In the guest bedroom, across the hall from the den, a four-lamp

center ceiling fixture is used, a 20-inch crystal reflector with floral metal.

In the large bath—which has three entrances, from the guest bedroom, master bedroom, and hall and two dressing rooms—a six-foot, four-inch strip of rose-tinted rubbed glass, 10⅝ inches wide, is used over fluorescent tubes in the dressing table and lavatory area; a similar smaller one in the second dressing room. Recessed light is used over the tub, and a teardrop ceiling fixture over the commode area.

All bathroom areas have separate sliding pocket doors. Large walk-in closets off the bath area have ceiling incandescent bulbs, with a teardrop fixture in front of the closets.

The master bedroom has three corner 75-watt reflector downlights 18 inches out from each corner, with a 150-watt brass and folded crystal hanging fixture in the fourth corner. A 150-watt flood lights the entry to the hall and the openings of hall closets.

In the hallway from the kitchen to the garage, one entryway is lighted by a 150-watt recessed ceiling fixture. The maid's room, off the kitchen hallway, has three 100-watt bulbs in a 16-inch crystal ceiling fixture; and in this dominantly white bath, two 100 watts are used in a twin crystal fixture over the lavatory.

The double garage, just to the rear, has one 150-watt bulb to each side of the ceiling.

A large patio, entered through sliding glass doors of the den, uses two adjustable 150-watt floods high from the side, a 40-watt bracket light on the wall, and aluminum cylinder lamps on each side in the overhang. And behind the low retaining wall of the patio are spaced three small 30-watt crystal spots, adjustable and in color reflectors, and an umbrella light, all the stick type and movable.

Twelve weatherproof double receptacles were placed on the exterior of the house. Two 40-gallon quick recovery hot water heaters were installed, and two heat pumps are used, a three-ton unit and a two-ton unit.

Leroy Darrow, residential sales consultant for OG&E, after showing some visitors around the new house, had this to say: "A home does not have to be of modern or contemporary design to have advanced lighting. Nor does outstanding lighting have to be too obvious."

Factory illumination

(Continued from page 44)

In addition to the plant lighting, the main office, an area of 8,000 square feet, was lighted by 60 recessed four- by four-foot fixtures with eight 40-watt, rapid-start lamps, with flat ribbed diffusers of polystyrene white plastic in a hinged frame. This method of lighting provided the effect of a luminous ceiling without the cost.

Norman Sherman, executive vice-president of Hyal Industries, pointed out that this was a carefully planned lighting job, each area being provided with exactly the right equipment.

The lobby, for example, is lighted in a subdued fashion by coach lanterns, while the office of the treasurer and founder, Hyman Sherman, is provided with a dimmer, so that the closed circuit TV can be easily viewed.

Redesigned transformers

(Continued from page 98)

scope of General Electric's "Preferred Design" program has been extended to include transformers for station auxiliary service and generator step-up units rated as large as 400,000 kva.

The "Preferred Design" concept involves building a line of transformers with the uniform mechanical features and accessories desired by the majority of utilities. Electrical characteristics, however, are specified by the purchaser for each application.

Contractor's lighting

(Continued from page 39)

Two electric heating pumps are hooked up to provide heat in winter, air conditioning in summer. In the event of a breakdown of a heat pump, the second heat pump would take care of all needs. For boosters we have installed electric baseboard units in all offices.

Service installed for our two-sectioned building is three-phase, four-wire, 400-amperes, fully housed, with a 400-ampere main breaker and six 100-ampere and four 60-ampere breakers.

We are convinced that the key to efficiency and productivity of personnel is tied up with good lighting. It eliminates that decline in production towards the end of the day when poor lighting has taken its toll in eyestrain and fatigue.

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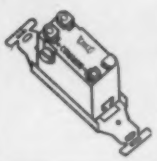

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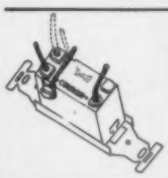

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Economic comment

(Continued from page 4)

at work are considerably better economically speaking than are those of people who are doubtful of their income status. Far greater interest is shown in spending than in saving, and this is good for the producers of America's consumer goods.

Industrial leaders appear to be reading the same signs for the downward trend in capital spending has been stopped, and modest increases are now in prospect for the balance of the year. The full impact of this trend will certainly come next year and should support the economy to new and more vigorous levels.

Washington report

(Continued from page 8)

the time employees entered service were criticized.

Servicemen hospitalized and discharged can wait to apply for return to work until after discharge from the hospital.

As a rule, an employer has no obligation to rehire employees who enlist and re-enlist voluntarily.

Federal district courts assume costs of suits by returning servicemen against employers. Federal district attorneys prosecute free of charge. Penalties can include back wages.

Although labor unions frequently have objected to giving returning servicemen the same status and seniority as men who remained on the job, responsibility rests with the employers and not the unions. So do penalties.

NLRB trial examiner asks for boycott ban

A TRIAL EXAMINER for the National Labor Relations Board recommended that the board ban a secondary boycott by IBEW Local 861 against Elco Electric, Inc., at Rayne, La.

Elco started business 2½ years ago with a contract with Local 861, the trial examiner reported. Subsequently the local stopped supplying men to Elco. The trial examiner said that Elco had been "caught . . . working non-union jobs."

When Elco subcontracted work on a bank at Crowley, La., a few miles from Rayne, Local 861 picketed. Elco was denied an injunction in federal court against the picketing because the bank was the only place at Crowley where the union could picket Elco.

A short time later Elco subcontracted electrical work on a new school at Crowley. The local picketed again. Members of other unions quit work. Again the federal court denied an injunction against the picketing.

But the judge indicated that if Elco "had a place of business in Crowley he would be inclined to give an injunction."

Elco immediately rented a building in Crowley, advertised the new office with signs, installed a telephone, put a clerk in to work full time, advertised in the local newspaper, removed material for Crowley area jobs to the new office, and ordered employees working in the Crowley area to report to the Crowley office.

The local continued, however, to picket the school site. Since Elco now had an office where the local could picket without disturbing employees of other subcontractors, the judge temporarily enjoined the picketing at the school.

The labor board trial examiner recommended that the board order a permanent ban on this picketing.

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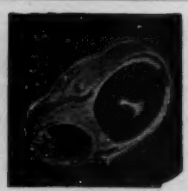

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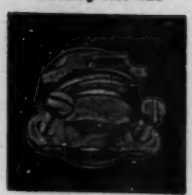

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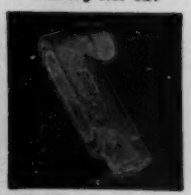

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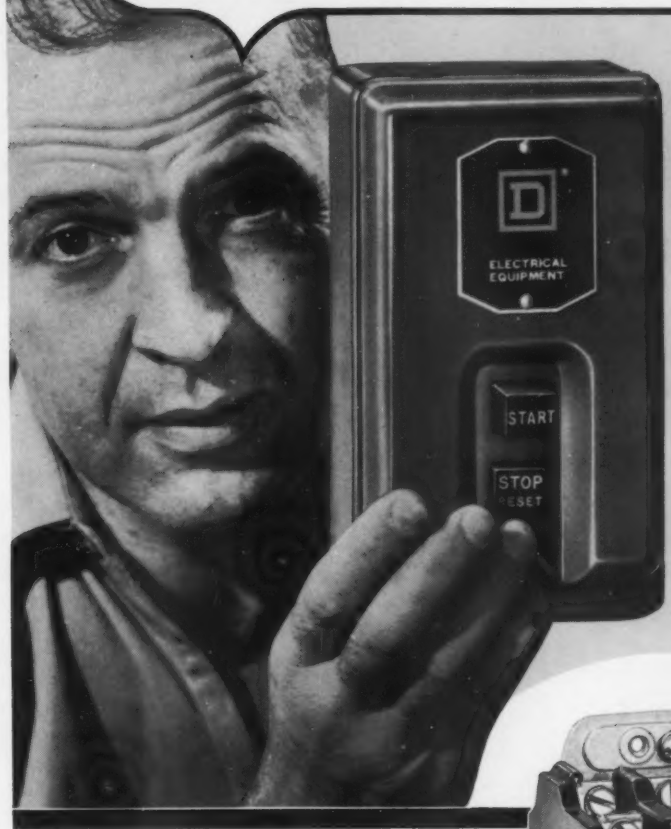

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- ***QWIK-MAKE, QWIK-BREAK!*** Positive snap-action opening and closing of contacts. Longer contact life
- ***TRIP-FREE OVERLOAD PROTECTION!*** Impossible for operator to hold motor circuit closed against overload
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- ***LONGER LIFE!*** *Toggle Action* operating mechanism. Heavy-duty construction throughout
- ***EASIER INSTALLATION!*** Wire it without removing starter from enclosure. All terminals have pressure wire connectors

- ***EASIER MAINTENANCE!*** "Off-the-Shelf" parts kits make normal maintenance and modifications easier than ever. They're easy to buy, easy to identify, and faster to install
- ***TAMPER-PROOF!*** Cover padlocking device prevents tampering by unauthorized personnel. Safety latch locks "start" button in "OFF" position
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CHOICE OF ENCLOSURES:

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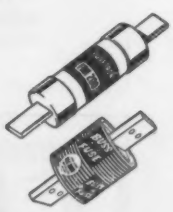

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